



## **Difference-in-Differences (DiD) Analysis of Data Driven Accounting Systems and its Impact on Financial Error Rates in SMEs**

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**Doi:** [10.63125/n4nr0d75](https://doi.org/10.63125/n4nr0d75)

**Received:** 21 September 2022; **Revised:** 18 October 2022; **Accepted:** 28 November 2022; **Published:** 28 December 2022;

### **Abstract**

*This study examined the impact of data-driven accounting systems on financial error rates in small and medium-sized enterprises, addressing the persistent problem of manual processing mistakes, weak reconciliation practices, fragmented records, delayed reporting, and limited internal control in SME accounting operations. The purpose was to determine whether SMEs using cloud-based and enterprise data-driven accounting systems achieve stronger financial error reduction than SMEs using manual, traditional, or basic accounting software. A quantitative, cross-sectional, case-based design was adopted, using 220 valid responses from SME owners, accountants, finance officers, bookkeepers, internal auditors, and financial managers across retail, manufacturing, logistics, services, and other sectors. The study focused on key variables including data-driven accounting system capability, accounting automation, real-time reporting, data analytics capability, system integration, internal control integration, and financial error reduction. Data were analyzed using descriptive statistics, reliability testing, correlation analysis, multiple regression, adoption-timing comparison, error-type sensitivity analysis, and Difference-in-Differences estimation. The findings showed a high level of data-driven accounting system capability among SMEs, with an overall mean of 4.08 and financial error reduction mean of 4.13. Reliability was strong, with the overall questionnaire producing Cronbach's alpha of 0.89. Correlation results showed that data-driven accounting system capability had a strong positive relationship with financial error reduction,  $r = 0.68$ ,  $p < 0.001$ . Regression findings indicated that the model explained 58.4% of the variance in financial error reduction, with internal control integration emerging as the strongest predictor,  $\beta = 0.31$ ,  $p < 0.001$ , followed by accounting automation,  $\beta = 0.27$ ,  $p < 0.001$ . Difference-in-Differences results showed that adopters reduced perceived financial error rates from 3.42 to 2.01, compared with non-adopters from 3.35 to 3.08, producing a significant DiD effect of -1.14,  $p < 0.001$ . The study implies that SMEs should treat digital accounting adoption as a financial accuracy, governance, and risk-control strategy, not only as a bookkeeping modernization effort.*

### **Keywords**

*Data-driven accounting systems; Financial error reduction; Difference-in-Differences analysis; SME accounting accuracy; Internal control integration.*

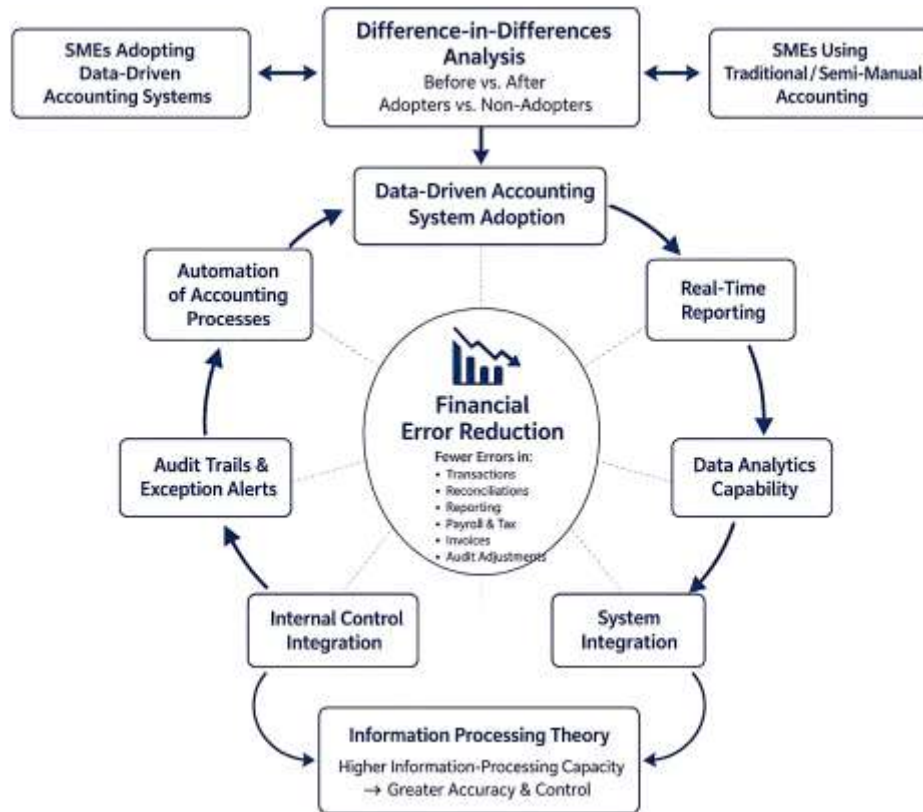
## INTRODUCTION

Data-driven accounting systems may be defined as computerized accounting information systems that collect, classify, process, store, analyze, and communicate financial data through integrated digital tools, automation routines, real-time reporting functions, and analytics-based controls (Abadie, 2005). In this research, the term refers not only to basic accounting software but also to a broader system of data-enabled financial processing that supports transaction recording, invoice matching, bank reconciliation, payroll calculation, tax reporting, audit trails, exception alerts, and managerial reporting. Accounting information systems are important because they connect accounting tasks with organizational information-processing capacity, enabling firms to transform raw transaction data into reliable financial information for control and decision-making (Ashbaugh-Skaife et al., 2008). Prior SME accounting research has shown that accounting information system alignment is associated with firm performance, which indicates that SMEs benefit when their accounting information needs are matched with appropriate system capacity. Integrated information systems also influence how accounting information is generated and used for management accounting and control purposes. Within this study, a data-driven accounting system is therefore understood as an accounting infrastructure that improves the speed, accuracy, traceability, and analytical usefulness of financial data (Ayyagari et al., 2007). This definition is closely connected to information systems success research, where system quality, information quality, service quality, use, user satisfaction, and net benefits are treated as important dimensions of information system effectiveness. In the SME context, data-driven accounting systems are particularly relevant because SMEs often operate with limited accounting staff, high owner-manager involvement, informal reporting practices, and resource constraints that may increase the risk of manual mistakes (Beck et al., 2005). Accounting information systems research has also emphasized the need to extend accounting technology studies toward management accounting and control issues, which supports the view that accounting systems should not be studied only as recording tools but also as control mechanisms. Enterprise resource planning research further shows that accounting technologies can generate benefits such as improved information quality, faster reporting, better internal control, and stronger decision support. These studies collectively position data-driven accounting systems as structured, technology-enabled accounting environments that can influence financial accuracy by reducing dependence on manual processing and strengthening the informational basis of SME financial management (Alshamaila et al., 2013).

Small and medium-sized enterprises are internationally significant because they form a substantial part of private-sector activity, employment creation, entrepreneurship, and local economic development across both developed and developing economies. SMEs are commonly defined by employee size, revenue, asset base, or industry-specific thresholds, and their international importance is linked to their contribution to employment, production networks, innovation, household income, and regional business formation. Cross-country evidence shows that SMEs are deeply connected with the wider business environment and that their growth is shaped by institutional, financial, legal, and market conditions. Research on firm-size constraints also indicates that smaller firms are more strongly affected by financial and legal barriers than larger firms, making accurate financial information important for credibility, financing, and operational continuity (Low et al., 2011). Access to finance remains a major growth constraint for SMEs, which increases the value of credible financial records and reliable accounting systems for enterprise survival and expansion. Accounting accuracy is therefore not a narrow technical issue for SMEs; it is connected to financing, tax compliance, supplier relationships, managerial planning, and stakeholder trust. Inaccurate financial records can weaken loan applications, distort cost control, create tax exposure, reduce managerial confidence, and damage external credibility (Plumlee & Yohn, 2010). Data-driven accounting systems become internationally relevant because they offer SMEs a way to formalize financial information production, reduce manual dependence, and improve the reliability of records used by banks, investors, regulators, suppliers, and owners. Cloud-computing adoption studies also support the international relevance of digital accounting infrastructure. Research on cloud adoption has found that relative advantage, top management support, firm size, technology readiness, competitive pressure, and trading partner pressure influence organizational adoption decisions. SME cloud-computing studies also show that cloud technologies can provide scalable information-system capabilities that were historically more accessible to larger

firms. Small-business cloud adoption has also been linked with factors such as convenience, cost, security, privacy, and reliability (Rom & Rohde, 2007). In addition, cloud-computing adoption has been explained through innovation characteristics and the technology–organization–environment context. These international studies support the relevance of examining data-driven accounting systems in SMEs because digital accounting adoption reflects both an internal financial-control issue and a wider transformation in how smaller firms access information-processing capability (Dimick & Ryan, 2014).

Figure 1: Data-Driven Accounting System Adoption and Financial Error Reduction in SMEs



Financial error rates refer to the frequency, magnitude, or perceived occurrence of mistakes in accounting records, transaction classifications, reconciliations, invoices, payroll calculations, tax computations, financial statements, and audit adjustments. In this study, financial error rates are treated as an outcome of accounting-process quality and accounting-system effectiveness. Financial errors may arise from incorrect data entry, duplicated transactions, missing supporting documents, weak account coding, delayed reconciliation, poor segregation of duties, limited review procedures, inconsistent tax treatment, or insufficient audit trail visibility (Doyle et al., 2007). Accounting research on internal control and earnings quality provides a strong foundation for linking system quality and control quality with financial accuracy. Evidence from financial reporting research shows that material weaknesses in internal control over financial reporting are associated with firm characteristics such as smaller size, financial weakness, complexity, rapid growth, and restructuring, which are conditions that can also exist in resource-constrained SMEs. Research also shows that internal control deficiencies are associated with lower accrual quality, while remediation of deficiencies is related to improved accrual quality. Studies on internal control weakness disclosures demonstrate that such weaknesses contain information about reporting risk, especially when weakness severity and disclosure characteristics indicate higher levels of control failure (Oliveira et al., 2014). Earnings-quality research further emphasizes that financial reporting quality is affected by firm performance, accounting measurement, and reporting-system conditions. Restatement research also shows that financial-reporting corrections are often linked to internal company errors rather than only to complex accounting standards. These studies provide the conceptual basis for treating financial error reduction

as a measurable and meaningful outcome. For SMEs, the financial error problem may be more operational than capital-market-oriented, but the logic remains similar: weak controls and poor information processing increase the likelihood that errors will not be prevented, detected, or corrected quickly. Data-driven accounting systems can be examined as mechanisms that strengthen transaction validation, automate repetitive calculations, standardize account classification, provide audit trails, and support exception reporting (Petter et al., 2008). The focus on financial error rates therefore makes the research more precise than a general study of digital accounting adoption because it asks whether data-driven systems are associated with a specific accounting-quality outcome: reduced financial mistakes within SME accounting processes.

The international development of digital accounting is strongly connected to automation, analytics, enterprise systems, cloud platforms, and data-intensive audit technologies. Accounting automation refers to the use of software rules, workflow controls, system-generated calculations, automatic posting, invoice recognition, reconciliation matching, and exception alerts to reduce repetitive manual accounting tasks (Vasarhelyi et al., 2015). Real-time reporting refers to the ability of accounting systems to update financial information continuously or near-continuously as transactions occur, allowing managers and accountants to observe balances, cash flows, receivables, payables, and exceptions with less delay. Data analytics capability refers to the use of structured and semi-structured data to identify patterns, anomalies, trends, outliers, and risk indicators in accounting records. Big-data accounting research argues that large-scale data can change managerial accounting, financial accounting, and reporting by increasing the relevance and transparency of accounting information. Accounting analytics research also describes a movement from structured enterprise resource planning data toward wider forms of accounting-relevant data, showing that accounting systems increasingly depend on integrated and analyzable information environments (Beck & Demirgüç-Kunt, 2006). Financial statement audit research explains that big data analytics can improve audit efficiency and effectiveness by supporting inspection, cleaning, transformation, modeling, pattern identification, and decision support. Audit evidence research further suggests that big data can serve as complementary audit evidence when evaluated for sufficiency, reliability, and relevance. Audit data analytics research also identifies new accounting research and practice needs around measurement, reporting, predictive analytics, and evidence evaluation. In the SME accounting context, these studies help define why data-driven accounting systems may reduce financial errors: automation can reduce manual entry mistakes; real-time reporting can shorten the time between error occurrence and detection; analytics can identify unusual transactions; and system integration can reduce inconsistencies between sales, inventory, payroll, banking, and reporting modules (Ismail & King, 2005). The study therefore treats accounting-system adoption not as a simple yes-or-no software choice but as a multidimensional capability involving automation, real-time information access, analytics, integration, and internal-control support. This multidimensional view is important because an SME may own accounting software but still experience high error rates when the software is used only for basic bookkeeping and not for validation, analytics, reconciliation, or control (Warren et al., 2015).

The theoretical foundation of this study is Information Processing Theory, which explains that organizations must develop sufficient information-processing capacity when uncertainty, transaction volume, task interdependence, and environmental complexity increase. In an accounting setting, information-processing capacity refers to the ability to capture transaction data accurately, process it consistently, detect exceptions, produce timely reports, and communicate reliable financial information to decision-makers. SMEs often face growing complexity as they expand customer bases, supplier relationships, digital sales channels, inventory movements, payroll obligations, tax responsibilities, and banking transactions. When accounting work is handled through manual spreadsheets, fragmented systems, or delayed reconciliations, the organization's information-processing capacity may be lower than its accounting-information requirements (Cao et al., 2015). SME accounting research provides a direct foundation for this logic by showing that alignment between accounting information system requirements and accounting information system capacity is associated with firm performance. Information-systems success research also supports the idea that system effectiveness depends on the interaction among system quality, information quality, use, satisfaction, and net benefits. Accounting information systems research further connects accounting technologies with management accounting

and control, suggesting that accounting systems become organizational control tools when they support planning, monitoring, and decision-making (Dechow et al., 2010). Under Information Processing Theory, data-driven accounting systems are expected to reduce financial errors because they increase the firm's capacity to process accounting information accurately and quickly. Automation reduces the burden of repetitive processing; integrated databases reduce duplicate entry across departments; real-time dashboards reduce reporting delay; analytics identify unusual patterns; and audit trails make transaction histories easier to verify (Kanellou & Spathis, 2013). The theory also supports the inclusion of internal control integration as a central construct because control features such as approval workflows, access restrictions, segregation of duties, validation rules, and exception alerts increase the system's ability to prevent and detect error. This theoretical framing helps connect the independent variable, data-driven accounting system adoption, with the dependent variable, financial error reduction. It also supports the study's measurement approach, where system capability is assessed through automation, real-time reporting, data analytics, integration, and control-related indicators, while financial error reduction is assessed through transaction, reconciliation, reporting, payroll, tax, invoice, and audit-adjustment error categories (Wing et al., 2018).

Difference-in-Differences analysis is an appropriate analytical logic for this topic because it evaluates whether the change in an outcome for a treated group differs from the change observed for a comparison group. In this study, the treatment group consists of SMEs that have adopted data-driven accounting systems, while the comparison group consists of SMEs that have not adopted such systems or continue to rely mainly on traditional or semi-manual accounting practices. The outcome is financial error rate or financial error reduction. Difference-in-Differences has been described as a widely used approach for evaluating treatment effects when treated and untreated groups can be compared over time. Methodological research also explains DiD as a causal-effects framework based on before-after and treatment-control comparisons. Policy evaluation research presents DiD as a useful method for evaluating changes when randomized designs are not feasible. Public health policy research further emphasizes the importance of research-design quality, comparison groups, and assumptions in DiD studies. For this thesis, the DiD logic is valuable because it strengthens the study beyond a simple cross-sectional comparison of adopters and non-adopters. A simple comparison may show that adopters have lower financial error rates, but that difference could reflect firm size, staff quality, industry type, or managerial capability (Granlund, 2011). DiD logic asks a more focused question: whether the change in financial error rates among adopters is greater than the change among non-adopters. Since the study is quantitative, cross-sectional, and case-study-based, the DiD component can be operationalized through recalled pre-adoption and post-adoption error-rate measures, available accounting records, or grouped survey items asking respondents to compare financial-error conditions before and after adoption (Yoon et al., 2015). This design should include control variables such as SME size, sector, years of operation, transaction volume, accounting staff experience, software type, and digital literacy. The treatment-post interaction term becomes the key estimate because it captures whether data-driven accounting system adoption is associated with a greater reduction in financial errors after accounting for baseline differences and general time-related change. The use of DiD logic therefore aligns the thesis with rigorous quasi-experimental thinking while remaining compatible with survey-based SME research (Gupta et al., 2013; Hammersley et al., 2008).

The motivation for this study arises from the need to connect three research areas that are often discussed separately: SME accounting practices, data-driven accounting system adoption, and measurable financial error reduction. SME research establishes that smaller firms are internationally important and face resource, finance, and institutional constraints that can make reliable accounting information especially valuable. Accounting information systems research shows that accounting-system alignment, integration, system quality, and information quality can support performance, control, reporting, and user satisfaction (Lechner, 2011). Internal-control and reporting-quality research shows that weak controls, poor remediation, and internal company errors are associated with lower reporting quality, restatements, and unreliable accruals. Cloud-computing and analytics research adds that scalable digital systems, cloud platforms, big data, analytics, and complementary audit evidence can improve information access, analytical capacity, and evidence evaluation in accounting-related work. Bringing these streams together, this thesis examines whether SMEs that use data-driven

accounting systems experience lower financial error rates and stronger error reduction than SMEs relying on traditional accounting processes (Appelbaum et al., 2017). The study is designed as a quantitative, cross-sectional, case-study-based investigation using a five-point Likert scale, descriptive statistics, correlation analysis, regression modeling, and Difference-in-Differences analysis. The central research focus is not merely whether SMEs adopt accounting technologies but whether adoption is associated with measurable improvement in accounting accuracy across transaction entry, reconciliation, reporting, payroll, tax, invoice, and audit-adjustment error categories. This framing gives the study a clear empirical direction and positions financial error reduction as the main outcome through which the value of data-driven accounting systems will be evaluated.

### **Background of the Study**

Small and medium-sized enterprises play a vital role in economic development, employment generation, innovation, and local business growth, but they often face serious challenges in maintaining accurate financial records. Many SMEs operate with limited accounting staff, restricted budgets, informal bookkeeping practices, and fragmented financial processes. These limitations increase the possibility of financial errors in areas such as transaction recording, invoice processing, payroll calculation, bank reconciliation, tax reporting, and financial statement preparation. In many SMEs, accounting tasks are still performed manually or through basic software that may not provide advanced controls, real-time reporting, automated validation, or analytical error detection. As business transactions increase in volume and complexity, traditional accounting practices may become insufficient for ensuring financial accuracy and timely decision-making. Data-driven accounting systems offer a modern solution by using automation, integrated databases, real-time dashboards, analytics tools, audit trails, and internal control features to improve the reliability of accounting information. These systems can reduce manual data entry, identify unusual transactions, support faster reconciliation, and provide managers with more accurate financial insights. For SMEs, the adoption of data-driven accounting systems is especially important because financial errors can affect cash flow management, tax compliance, loan applications, supplier relationships, investor confidence, and overall business sustainability. This study focuses on the impact of data-driven accounting systems on financial error rates in SMEs using a Difference-in-Differences analytical logic. The study compares financial error changes between SMEs that adopt data-driven accounting systems and those that continue using traditional or less automated accounting methods. By using a quantitative, cross-sectional, case-study-based approach, the research examines whether accounting automation, real-time reporting, data analytics capability, system integration, and internal control features contribute to reducing financial errors. The background of this study is therefore rooted in the growing need for SMEs to strengthen accounting accuracy, improve financial control, and make better use of digital accounting technologies to reduce operational and reporting mistakes.

### **Problem Statement**

Small and medium-sized enterprises increasingly depend on accurate financial information to manage cash flow, monitor performance, prepare tax reports, secure financing, and make operational decisions. However, many SMEs continue to experience financial errors due to manual accounting practices, limited automation, fragmented record-keeping, weak internal controls, delayed reconciliations, and insufficient use of data analytics. These errors may appear in several forms, including incorrect transaction entries, duplicate invoices, bank reconciliation mismatches, payroll miscalculations, tax-reporting mistakes, wrong account classifications, and inaccurate financial statements. Such errors can weaken the reliability of accounting information and create serious consequences for SMEs, including poor decision-making, cash flow problems, compliance risks, audit adjustments, reduced lender confidence, and operational inefficiency. Although data-driven accounting systems are increasingly promoted as tools for improving financial accuracy, many SMEs do not fully understand whether these systems actually reduce financial error rates in practice. Some SMEs adopt digital accounting tools only for basic bookkeeping, while others use more advanced features such as automation, real-time reporting, analytics dashboards, integrated databases, approval workflows, and audit trails. This creates a research problem because the mere presence of accounting software does not necessarily prove that financial errors are reduced. There is a need to examine whether SMEs that adopt data-driven accounting systems experience greater improvement in financial accuracy compared with SMEs

that continue using traditional or less automated accounting practices. Another important issue is that many existing studies discuss digital accounting adoption, cloud accounting, accounting information systems, or SME financial management in general terms, while fewer studies directly focus on financial error rates as the main outcome. In addition, the application of Difference-in-Differences logic in this area remains limited, especially in SME-based accounting research. This creates a methodological gap because a simple comparison between adopters and non-adopters may not clearly show the change in financial error rates before and after system adoption. Therefore, this study addresses the problem by examining the impact of data-driven accounting systems on financial error rates in SMEs using a quantitative, cross-sectional, case-study-based design supported by descriptive statistics, correlation analysis, regression modeling, and Difference-in-Differences analysis.

### **Objectives of The Study**

The main objective of this study is to examine the impact of data-driven accounting systems on financial error rates in small and medium-sized enterprises using a quantitative, cross-sectional, case-study-based approach. Specifically, the study aims to determine whether the adoption of data-driven accounting systems contributes to the reduction of financial errors in SME accounting processes. The first objective is to assess the level of adoption of data-driven accounting systems among SMEs by examining the extent to which firms use accounting automation, real-time financial reporting, data analytics capability, system integration, and internal control features. The second objective is to identify the common types of financial errors experienced by SMEs, including transaction entry errors, reconciliation errors, invoice and billing errors, payroll errors, tax-related errors, reporting inaccuracies, and audit adjustment errors. The third objective is to examine the relationship between data-driven accounting system capabilities and financial error reduction. This will allow the study to determine whether stronger automation, better reporting speed, improved analytics capability, and stronger internal controls are associated with fewer financial errors. The fourth objective is to evaluate the predictive effect of data-driven accounting systems on financial error reduction through regression analysis. This objective will help identify which system features have the strongest influence on accounting accuracy. The fifth objective is to apply a Difference-in-Differences analytical logic by comparing financial error changes between SMEs that adopted data-driven accounting systems and SMEs that did not adopt such systems. This objective is important because it allows the research to move beyond a general comparison and examine whether adopters experienced greater improvement in financial error reduction. The sixth objective is to analyze whether adoption timing influences the level of error reduction by comparing non-adopters, recent adopters, mid-term adopters, and long-term adopters. Overall, these objectives are designed to provide a clear empirical understanding of how data-driven accounting systems influence financial accuracy in SMEs.

### **Research Hypotheses**

The research hypotheses of this study are developed to test the relationship between data-driven accounting systems and financial error reduction in small and medium-sized enterprises. Since the study focuses on a quantitative design, the hypotheses provide a clear statistical basis for examining whether accounting technology adoption significantly influences financial accuracy. The main assumption of the study is that SMEs using data-driven accounting systems are more likely to experience lower financial error rates than SMEs relying on manual, traditional, or less automated accounting practices. Therefore, the first hypothesis proposes that data-driven accounting system adoption has a significant positive effect on financial error reduction in SMEs. This hypothesis reflects the central argument of the study and connects directly with the main research objective. The second hypothesis proposes that accounting automation has a significant positive relationship with financial error reduction. This is based on the expectation that automated transaction posting, invoice processing, calculation functions, and reconciliation tools reduce manual mistakes. The third hypothesis proposes that real-time financial reporting significantly improves financial error detection and reduction in SMEs. This hypothesis assumes that faster access to updated financial information allows accountants and managers to identify and correct errors earlier. The fourth hypothesis proposes that data analytics capability significantly predicts lower financial error rates. This is because analytics tools may help detect unusual transactions, identify inconsistencies, and support evidence-based accounting review. The fifth hypothesis proposes that internal control integration significantly

strengthens the relationship between data-driven accounting system adoption and financial error reduction. This means that accounting systems with approval workflows, access controls, audit trails, and validation rules are expected to produce stronger error-reduction outcomes. The sixth hypothesis proposes that SMEs that adopt data-driven accounting systems experience a greater reduction in financial error rates than SMEs that do not adopt such systems. This final hypothesis is especially important for the Difference-in-Differences component of the study because it focuses on comparing changes between treatment and control groups. Together, these hypotheses provide the statistical foundation for correlation analysis, regression modeling, and Difference-in-Differences estimation.

### **Significance of the Research**

i. **Significance for SME owners and managers:** This research is significant for SME owners and managers because it explains how data-driven accounting systems can support better financial accuracy, stronger control, and more reliable decision-making. Many SME owners depend on financial reports to make decisions about pricing, purchasing, staffing, borrowing, investment, and expansion. If financial records contain errors, managerial decisions may become inaccurate or risky. This study helps SME leaders understand which accounting system features are most useful for reducing financial errors.

ii. **Significance for accountants and finance officers:** The study is useful for accountants, bookkeepers, finance officers, and internal auditors working in SMEs because it highlights the role of automation, real-time reporting, analytics, reconciliation tools, and audit trails in improving accounting quality. It may encourage accounting professionals to move beyond manual record-keeping and make better use of data-driven accounting features for error detection and prevention.

iii. **Significance for accounting software providers:** This research is significant for accounting software developers and vendors because it identifies the system features that may contribute most strongly to financial error reduction. Software providers can use the findings to design SME-focused accounting systems with better automation, user-friendly dashboards, built-in controls, anomaly detection, and reporting tools.

iv. **Significance for policymakers and SME support agencies:** The study is important for policymakers, business development agencies, and financial support institutions because it shows the value of digital accounting adoption in improving SME financial discipline. The findings may support training programs, digital transformation policies, and incentives that encourage SMEs to adopt reliable accounting technologies.

v. **Significance for academic researchers:** This research contributes to academic knowledge by linking data-driven accounting systems, financial error rates, and Difference-in-Differences analysis within the SME context. It provides a focused framework for studying accounting accuracy as a measurable outcome of digital accounting adoption.

vi. **Significance for financial institutions and lenders:** Banks, microfinance institutions, investors, and lenders may also benefit from this study because accurate SME financial records improve credit assessment, loan monitoring, and risk evaluation. When SMEs reduce financial errors, their financial statements become more credible and useful for external stakeholders.

### **LITERATURE REVIEW**

The literature review of this study examines existing knowledge on data-driven accounting systems, financial error rates, accounting information systems, SME accounting practices, internal control mechanisms, and Difference-in-Differences analysis. The purpose of the review is to establish a strong conceptual and empirical foundation for understanding how data-driven accounting systems may influence financial error reduction in small and medium-sized enterprises. SMEs often face accounting challenges due to limited resources, informal financial practices, dependence on manual records, low levels of digital integration, and limited access to specialized accounting expertise. These conditions can increase the likelihood of financial errors in transaction recording, reconciliation, payroll processing, invoicing, tax reporting, and financial statement preparation. The literature on accounting information systems suggests that digital and integrated accounting tools can improve the quality, timeliness, accuracy, and usefulness of financial information. In the context of this study, data-driven accounting systems are viewed as systems that combine automation, analytics capability, real-time reporting, cloud-based access, system integration, and internal control features. The literature also

shows that financial error reduction depends not only on software adoption but also on how effectively the system is used to validate transactions, detect inconsistencies, support reconciliations, generate reports, and maintain audit trails. Therefore, the review will consider both technological and organizational dimensions of accounting system adoption. The theoretical foundation of the study is Information Processing Theory, which explains how organizations require stronger information-processing capacity as operational complexity increases. This theory is relevant because SMEs must process growing volumes of financial data accurately and quickly to support decision-making and compliance. The literature review will also examine Difference-in-Differences analysis as a methodological approach for comparing financial error changes between SMEs that adopt data-driven accounting systems and those that do not. By reviewing these areas, the chapter will identify the research gap and support the development of the conceptual framework, research questions, and hypotheses. Overall, the literature review provides the foundation for examining whether data-driven accounting systems can meaningfully reduce financial error rates in SMEs.

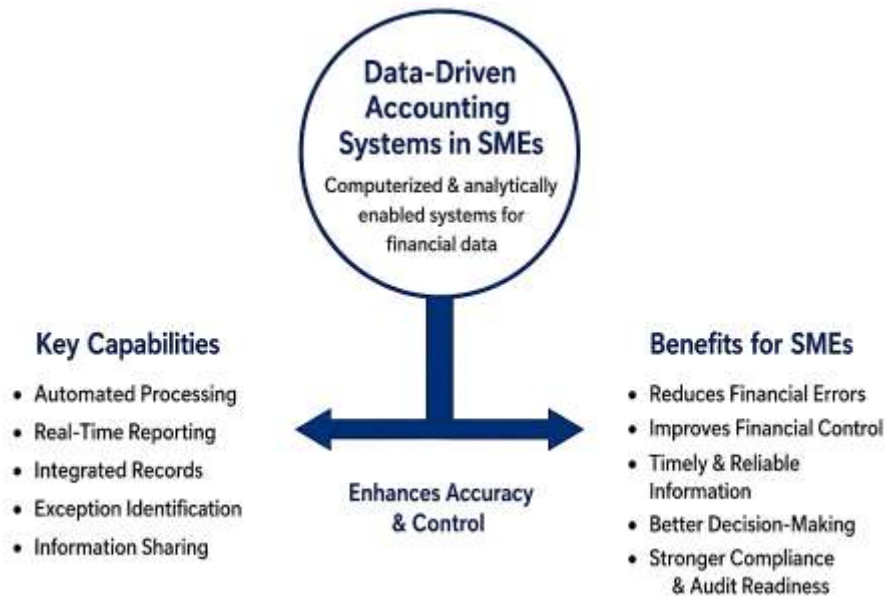
### **Data-Driven Accounting Systems in SMEs**

Data-driven accounting systems in SMEs refer to computerized and analytically enabled accounting arrangements that collect transaction data, process financial information, organize records, and generate reports for managerial and statutory use. In smaller enterprises, these systems often begin as computerized bookkeeping applications, but they become data-driven when they support structured databases, automated calculations, transaction classification, real-time access, exception identification, and information sharing across business functions. The importance of such systems is rooted in the fact that SMEs usually operate with fewer accounting employees, limited review layers, and less formalized internal control procedures than larger organizations. A data-driven accounting system can therefore function as both a recording mechanism and a control-support mechanism because it reduces repeated manual entry, stores transaction histories, supports retrieval of evidence, and improves the consistency of financial reporting. Earlier research on accounting information system usefulness explains that AIS is designed to collect, record, maintain, process, and communicate economic information to internal and external stakeholders, making it highly relevant for firms that need timely and reliable accounting data for decision-making ([Abdur & Iftekhar, 2021](#); [Salehi et al., 2010](#)). Similarly, empirical evidence on AIS usefulness indicates that accounting information systems support organizational performance by providing data for planning, control, coordination, analysis, and decision-making ([Golam & Amir, 2022](#); [Soudani, 2012](#)). These ideas are directly applicable to SMEs because financial records often serve multiple purposes at once: owner-manager control, tax reporting, loan applications, inventory monitoring, supplier payments, payroll preparation, and cash-flow planning. When SMEs lack systematic accounting information, financial decisions may depend on memory, informal estimates, or incomplete spreadsheets. A data-driven accounting system reduces this weakness by transforming routine accounting events into structured information that can be checked, summarized, analyzed, and reported with greater consistency. Thus, data-driven accounting becomes an operational foundation for accuracy rather than a simple technological accessory. It also strengthens the informational discipline required for growth.

Within SMEs, the value of data-driven accounting systems can also be understood through their effect on performance measurement and operational visibility. Traditional accounting practices may capture transactions only after events occur, while computerized and integrated systems allow firms to generate updated information on sales, expenses, receivables, payables, inventory movement, and cash position. This is important because SME managers often combine ownership, control, and daily operational responsibility, so accounting information must be understandable, timely, and usable for immediate decisions. Evidence from Spanish SMEs shows that the use of accounting information systems is positively related to performance indicators, particularly when the systems support fiscal management, banking management, and better use of accounting information for business monitoring ([Grande et al., 2011](#); [Hasan & Uddin, 2022](#)). This finding suggests that AIS adoption is not limited to record storage; it can become part of the firm's managerial infrastructure. A data-driven accounting system can improve financial control by providing standardized coding, automated posting, digital document storage, system-generated balances, and routine reports that reduce uncertainty about the firm's current financial condition. For this research, such capabilities are important because financial

error rates in SMEs often arise when accounting information is delayed, duplicated, misclassified, or disconnected from business operations. An SME that uses integrated accounting modules can compare invoices with payments, match bank transactions with ledger entries, identify unusual balances, and trace transactions from source documents to final reports. These features are likely to reduce the frequency of errors and increase the possibility of early correction. In addition, computerized systems can support accountability because user access, approval routes, and transaction histories create a clearer record of who entered, reviewed, approved, or modified financial data. This makes the system relevant not only for accounting efficiency but also for internal control and audit readiness. As a result, accounting information becomes more verifiable, comparable, and managerial.

**Figure 2: Data-Driven Accounting Systems in SMEs: Key Capabilities and Benefits**



Recent developments in accounting technology also show that data-driven accounting systems are increasingly linked with real-time reporting and cloud-based accounting. Real-time reporting is important because conventional periodic reporting may not provide sufficiently updated information for firms operating in competitive and fast-moving environments. Research on real-time accounting explains that enterprises require more current information to respond to operational problems and opportunities, and that technologies such as business process management, mobile access, cloud computing, business intelligence, and enterprise application integration can support real-time reporting (Hossain & Uddin, 2022; Trigo et al., 2014). For SMEs, this means that accounting systems can move from delayed record preparation toward continuous financial monitoring. Cloud accounting further extends this capability by allowing business owners, accountants, auditors, and other authorized users to access financial data through internet-based platforms rather than locally installed software. Cloud accounting has been described as a service-based business model that can modernize accounting practice by supporting shared access, updated information, and collaboration among accounting users (Dimitriu & Matei, 2015; Sany & Siful, 2022). These features are highly relevant to SMEs because many smaller firms cannot afford complex internal IT infrastructure, yet they require reliable accounting tools that are flexible, scalable, and accessible. In the context of financial error reduction, cloud-based and real-time systems may improve accuracy by reducing version conflicts, enabling quicker review, supporting automated backups, and making financial data available for timely reconciliation. They may also support stronger collaboration between SME owners and external accountants, which is important where internal accounting expertise is limited. Therefore, data-driven accounting systems in SMEs should be viewed as a combination of automation, integration, reporting

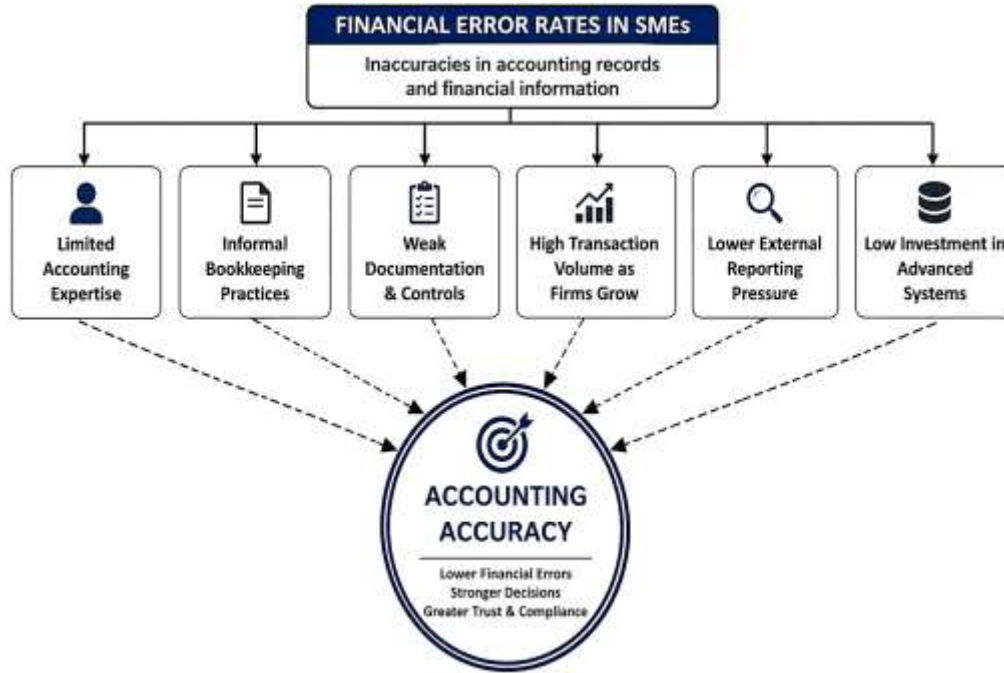
speed, analytical capacity, and digital accessibility. This view supports the present study because financial error reduction depends not only on whether an SME uses accounting software, but also on whether the system creates timely, accurate, analyzable, and controllable financial information.

### **Financial Error Rates and Accounting Accuracy in SMEs**

Financial error rates in SMEs refer to the frequency and extent of inaccuracies that occur in accounting records, financial statements, transaction classifications, reconciliations, invoices, payroll calculations, tax records, and internal financial reports. In the SME context, these errors are often connected with limited accounting expertise, weak documentation routines, informal bookkeeping practices, and lower investment in advanced accounting infrastructure. Accounting accuracy is important because SMEs depend on reliable financial information for budgeting, cash-flow planning, loan applications, supplier payments, tax compliance, and business decision-making. When financial information is inaccurate, managers may underestimate expenses, overstate revenues, misjudge liquidity, or make poor financing decisions. Research on private firms shows that financial reporting quality differs according to reporting demand, ownership structure, and the incentives faced by firms outside public capital markets (Ball & Shivakumar, 2005; Binte & Iftekhhar, 2022). This is relevant to SMEs because many small firms are privately held and may face lower formal reporting pressure than listed companies. Lower external pressure can reduce the urgency to maintain highly disciplined accounting systems, which may increase the risk of undetected errors. In small firms, accounting accuracy is not only a matter of technical compliance but also a practical requirement for survival and growth. Financial errors can create tax penalties, audit adjustments, delayed payments, incorrect inventory valuation, poor cost estimation, and reduced credibility with lenders. Therefore, financial error rates should be studied as a central indicator of accounting system effectiveness. A lower financial error rate suggests stronger transaction control, better record consistency, improved review procedures, and more reliable financial reporting. In this research, financial error reduction is treated as the main dependent outcome because it directly reflects whether data-driven accounting systems improve the practical quality of SME accounting processes. This focus allows the study to move beyond general technology adoption and examine whether accounting system use produces measurable improvements in accuracy, control, and reliability.

The quality of financial reporting in SMEs is strongly influenced by whether financial statements are prepared regularly, used by decision-makers, and supported by reliable underlying records. Evidence from privately held small businesses shows that the production and use of financial statements are shaped by internal decision needs and external stakeholder demands, including lenders, tax authorities, and investors (Allee & Yohn, 2009). This suggests that accounting accuracy in SMEs is partly demand-driven: when owners, lenders, or other stakeholders require reliable information, firms are more likely to prepare and use formal financial statements. However, the preparation of statements alone does not guarantee accuracy if source transactions contain errors or if reconciliation procedures are weak. In start-up and small-business environments, formal financial statement and projection preparation are also associated with factors such as outside financing, venture scale, competitive pressure, and uncertainty reduction (Cassar, 2009). This indicates that SMEs may place more value on accurate accounting information when business complexity or external scrutiny increases. Financial errors become more harmful as SMEs grow because larger transaction volumes make manual checking more difficult and increase the possibility of duplicated entries, missing invoices, incorrect classifications, and delayed corrections. Accuracy also depends on the connection between accounting information and managerial action. If financial reports are prepared only for tax filing and not reviewed for operational decisions, errors may remain hidden until they create cash-flow or compliance problems. In this sense, financial error rates are not simply accidental outcomes; they are linked to the strength of the firm's accounting routines, review culture, and information-use practices. For this reason, SME accounting accuracy should be examined through both system-based and behavior-based perspectives. A firm may own accounting software, but error reduction depends on whether the software is used consistently for recording, reconciliation, reporting, validation, and decision support. Financial error reduction also depends on the credibility and verification of accounting information (Minnis, 2011).

**Figure 3: Financial Error Rates and Accounting Accuracy in SMEs**



This finding is important for SMEs because many small firms depend on bank loans, supplier credit, and external financing, all of which require trustworthy financial information. When accounting records contain frequent errors, lenders may perceive the firm as risky, poorly controlled, or difficult to evaluate. Accurate accounting records therefore support both internal management and external trust. Broader evidence comparing private and public firms also shows that reporting quality is influenced by demand for financial information, incentives, and monitoring conditions (Hope et al., 2013). This is highly relevant for SMEs because many are private firms with fewer formal monitoring mechanisms than public companies. As a result, financial error rates may be higher when internal controls, external verification, and accounting-system capabilities are weak. Data-driven accounting systems can address this problem by increasing transparency, standardizing transaction processing, improving audit trails, and supporting timely review of financial records. They can also help SMEs detect inconsistencies across accounts, identify unusual transactions, and reduce dependence on memory-based or spreadsheet-based bookkeeping. In the present study, financial error rates are examined across several categories, including transaction entry errors, reconciliation errors, invoice and billing errors, payroll errors, tax-related errors, reporting inaccuracies, and audit adjustment errors. This multidimensional approach is important because accounting accuracy is not limited to one stage of the financial process. Errors may occur at the point of data entry, during classification, during reconciliation, or during final report preparation. Therefore, studying financial error reduction in SMEs provides a strong basis for evaluating whether data-driven accounting systems create real improvements in accounting reliability.

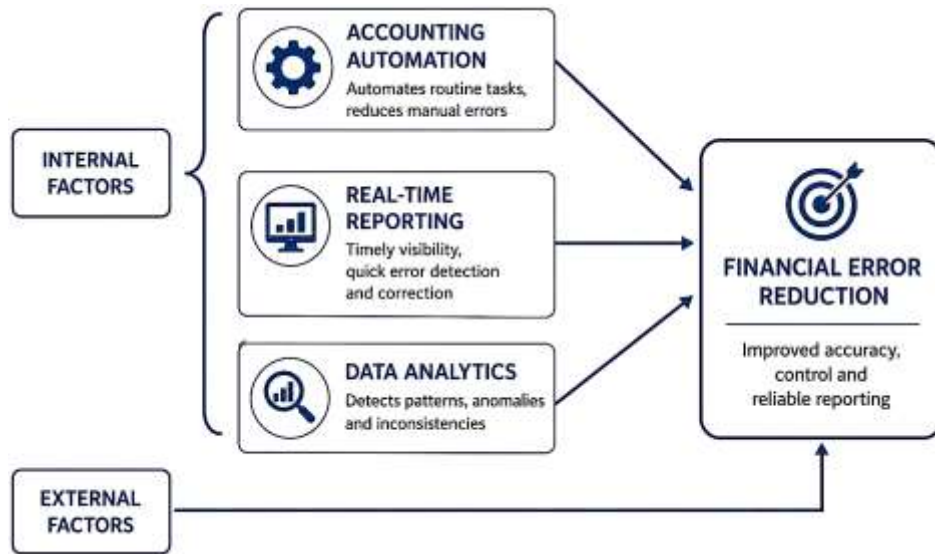
#### **Accounting Automation, Real-Time Reporting, and Data Analytics**

Accounting automation is a central component of data-driven accounting systems because it replaces repetitive manual procedures with rule-based digital processes that can record, classify, validate, and summarize financial transactions more consistently. In SMEs, automation may include automatic invoice posting, bank-feed matching, payroll calculation, recurring journal entries, tax computation, expense categorization, approval routing, and exception alerts. These functions are important because financial errors often occur when accounting staff repeatedly enter the same data, manually transfer figures between spreadsheets, or process transactions without built-in validation controls. Automation reduces these weaknesses by standardizing routine tasks and creating a more consistent transaction-processing environment. Robotic process automation is especially relevant because it can automate rules-based, repetitive, and structured accounting tasks that previously required human intervention.

In accounting and auditing, robotic process automation has been described as a technology that can perform routine procedures, reduce manual workload, and allow professionals to focus on higher-value judgment-based tasks (Kokina & Davenport, 2017). This is important for SMEs because many smaller businesses do not have large accounting teams, making efficient task allocation essential. Automation can also strengthen internal control because automated workflows can require authorization, restrict access, maintain audit logs, and reduce opportunities for undocumented changes. In relation to financial error reduction, accounting automation may reduce transaction entry errors, duplicate postings, calculation mistakes, payroll errors, and invoice-processing inconsistencies. However, automation becomes more useful when it is integrated with reliable accounting data and clearly designed business rules. A poorly configured system may repeat errors quickly, while a properly configured system can prevent errors before they enter the financial records. Therefore, the role of automation in this study is not treated as simple software use; it is treated as a measurable accounting capability that improves the accuracy, consistency, and reliability of SME financial processing.

Real-time reporting strengthens accounting accuracy by reducing the delay between transaction occurrence, accounting recognition, review, and correction. Traditional accounting systems often depend on periodic reporting, where financial information is summarized weekly, monthly, or at the end of a reporting cycle. This delayed reporting structure can allow errors to remain hidden for long periods, especially in SMEs where accounting review may be irregular. Real-time or near-real-time reporting allows managers and accountants to monitor cash balances, receivables, payables, sales, expenses, inventory movements, and account exceptions more quickly. Continuous monitoring research shows that automated control systems can examine business process controls and generate more timely information for audit and control purposes (Alles et al., 2006). This idea is relevant to SMEs because continuous monitoring principles can be adapted to smaller accounting environments through dashboards, alerts, approval notifications, and reconciliation updates. Real-time reporting does not only accelerate information delivery; it also improves the usefulness of accounting data for decision-making and error correction. When SMEs can observe unusual balances, overdue receivables, mismatched bank entries, or unexpected expense movements quickly, they are more likely to identify and correct financial errors before those errors affect financial statements or managerial decisions. Continuous monitoring also increases transparency because accounting activities become traceable through system-generated records. This transparency can reduce the risk of hidden mistakes, unauthorized modifications, and incomplete documentation. In this research, real-time reporting is therefore viewed as a bridge between accounting automation and financial error reduction. Automation processes transactions, while real-time reporting makes the results visible and reviewable. For SMEs, this is particularly important because owners and managers often require immediate financial information to manage liquidity, supplier obligations, payroll responsibilities, and tax commitments. Thus, real-time reporting supports both operational control and accounting accuracy. Data analytics expands the role of accounting systems from record-keeping to evidence-based analysis, anomaly detection, and performance monitoring. In the accounting context, analytics refers to the use of structured data, transaction histories, dashboards, statistical summaries, visualizations, and pattern-recognition tools to identify unusual activities, inconsistencies, and risks in financial data. Business intelligence and analytics research in management accounting shows that BI&A technologies support reporting, decision-making, planning, control, and performance evaluation by transforming accounting data into useful managerial information (Rikhardsson & Yigitbasioglu, 2018). This is highly relevant to SMEs because many accounting errors are not immediately visible in individual transactions but become clearer when data are analyzed across accounts, periods, customers, suppliers, or payment patterns. Big data analytics research in accounting also argues that accountants can create value by interpreting structured and unstructured data, applying analytical judgment, and using data to support better financial and managerial decisions (Richins et al., 2017). In auditing research, big data techniques have been connected with fraud modeling, financial distress modeling, quantitative analysis, and audit evidence evaluation, showing that analytics can strengthen the examination of accounting information (Gepp et al., 2018).

**Figure 4: Accounting Automation, Real-Time Reporting, and Data Analytics for Financial Error Reduction**

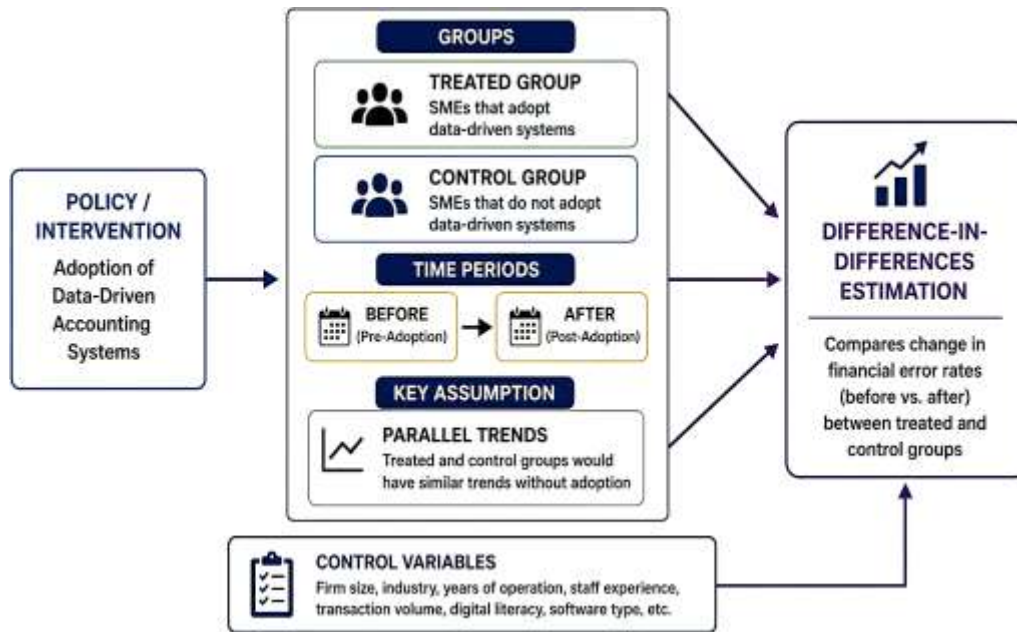


For SMEs, analytics may support error reduction by identifying duplicate invoices, unusual expense trends, abnormal payroll changes, unexpected tax amounts, unmatched transactions, or repeated reconciliation differences. These functions help accountants move from reactive correction to proactive detection. Data analytics also supports the Difference-in-Differences logic of this study because error patterns can be compared between SMEs that use data-driven systems and those that rely on traditional accounting methods. When combined with automation and real-time reporting, analytics can create a stronger accounting control environment. Automation reduces manual processing errors, real-time reporting increases visibility, and analytics identifies patterns that require investigation. Therefore, this study treats accounting automation, real-time reporting, and data analytics as connected dimensions of data-driven accounting system capability.

#### **Difference-in-Differences Analysis in Accounting and Business Research**

Difference-in-Differences analysis is a quasi-experimental estimation approach used to examine whether an outcome changes differently for a treated group compared with a control group over time. In the context of accounting and business research, this method is useful when researchers cannot randomly assign firms to a treatment condition but can observe differences between firms that experienced an intervention and firms that did not. For this study, the treatment refers to the adoption of data-driven accounting systems, while the outcome refers to financial error rates or financial error reduction in SMEs. The basic logic of DiD is that the researcher compares the change in financial errors among adopters before and after system adoption with the change among non-adopters over a comparable period. This design is stronger than a simple comparison between adopters and non-adopters because it accounts for baseline differences that may exist between the two groups. For example, SMEs that adopt accounting technology may already be more organized, larger, or better managed than SMEs that do not adopt such systems. DiD helps address this concern by focusing on changes rather than only final differences. Econometric research explains that DiD is valuable because it can identify treatment effects when the researcher observes treated and untreated groups across time and when the comparison group represents the untreated trend that the treated group would have followed without the intervention (Athey & Imbens, 2006). In accounting research, this logic is relevant because accounting system adoption is usually not random; firms decide to adopt systems based on cost, need, digital readiness, management attitude, transaction volume, and operational complexity. Therefore, a DiD framework allows this study to estimate whether financial error reduction is linked to data-driven accounting system adoption rather than merely reflecting pre-existing differences among SMEs.

**Figure 5: Difference-in-Differences Framework for Evaluating Financial Error Reduction in SMEs**



The strength of Difference-in-Differences analysis depends heavily on research design, comparison-group selection, model specification, and statistical inference. One of the most important assumptions is the parallel trends assumption, which means that in the absence of treatment, the treated and control groups would have followed similar outcome trends. In this research, that assumption means that SMEs adopting data-driven accounting systems and SMEs not adopting them would have shown similar changes in financial error rates if system adoption had not occurred. This assumption is difficult to prove fully, but it can be supported through careful sampling, comparison of pre-adoption characteristics, control variables, and sensitivity checks. Program evaluation literature emphasizes that DiD is one of several empirical evaluation tools and that its credibility improves when researchers combine strong design logic with appropriate covariates and robustness procedures (Blundell & Costa Dias, 2009). Statistical inference is another important issue. DiD studies often use repeated observations or grouped data, which may create correlated errors and misleading significance levels if standard errors are not handled properly. Research on inference in DiD and panel-data settings shows that researchers must be careful when estimating standard errors, especially when the number of groups is small or when outcomes are correlated within firms, industries, or time periods (Donald & Lang, 2007). For SME accounting research, this concern is important because SMEs may be grouped by industry, region, adoption timing, or accounting software type. If those grouped characteristics influence financial errors, the analysis must account for them. In this study, the DiD model should therefore include relevant control variables such as SME size, industry sector, years of operation, accounting staff experience, transaction volume, digital literacy, and software type. The treatment-post interaction term will represent the estimated DiD effect, showing whether financial error reduction is greater among adopters than among non-adopters after the adoption period.

In business and accounting studies, Difference-in-Differences can be strengthened by combining it with regression modeling, matching logic, and robustness checks. General econometric research on program evaluation explains that modern causal evaluation often uses regression-based approaches, matching strategies, and panel-data logic to improve the comparability of treated and untreated observations (Imbens & Wooldridge, 2009). This is directly relevant to the present study because SMEs that adopt data-driven accounting systems may differ from non-adopters in several observable characteristics. For example, adopters may have larger transaction volumes, stronger management capacity, better trained accountants, or greater access to financial resources. If these differences are ignored, the estimated impact of accounting system adoption may be biased. A useful solution is to compare SMEs with similar observable characteristics or to include those characteristics as control variables in the

regression model. Research on using propensity scores in DiD models shows that combining matching or weighting with DiD can improve the estimation of policy or intervention effects when treatment and control groups differ at baseline (Stuart et al., 2014). In this study, this logic can be applied by comparing adopters and non-adopters with similar SME profiles before estimating the impact of system adoption on financial error reduction. The DiD approach can also be adapted to the cross-sectional nature of the study by asking respondents to report financial error conditions before and after adoption or by using available accounting records where possible. Although actual longitudinal records would provide stronger evidence, a carefully designed survey can still support a quasi-DiD structure when it captures pre-adoption and post-adoption error perceptions for adopters and comparable time-based changes for non-adopters. Therefore, DiD analysis provides a rigorous methodological foundation for this research by linking data-driven accounting system adoption to measurable changes in financial error rates while controlling for firm-level differences that may affect accounting accuracy.

#### **Theoretical Framework: Information Processing Theory**

The theoretical framework of this study is based on **Information Processing Theory**, which explains that organizations must develop adequate information-processing capacity when their operational complexity, uncertainty, transaction volume, and decision requirements increase. In the context of SMEs, accounting work involves continuous processing of invoices, receipts, payroll records, tax obligations, supplier payments, customer transactions, bank reconciliations, and financial reports. When these activities are handled through manual or weakly integrated systems, the organization may experience a gap between its accounting-information needs and its actual information-processing capacity. This theoretical logic can be expressed as:

$$AIC_i = f(OC_i, TU_i, TV_i, DR_i)$$

Where:

$AIC_i$  = Accounting Information Complexity of SME  $i$

$OC_i$  = Operational Complexity

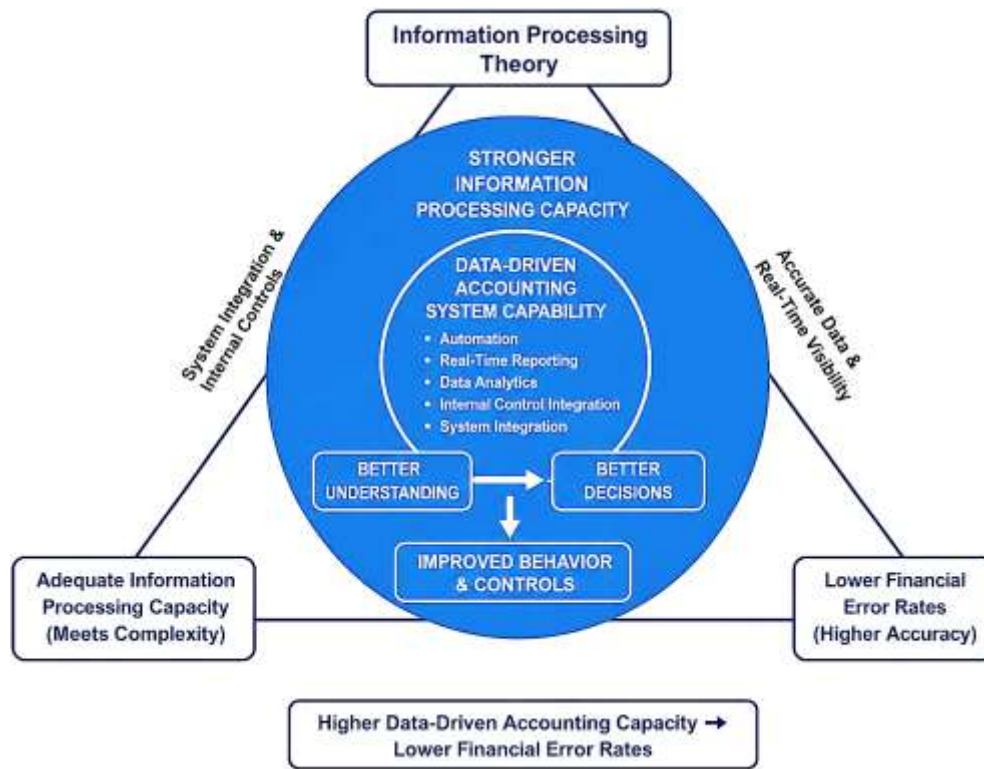
$TU_i$  = Transaction Uncertainty

$TV_i$  = Transaction Volume

$DR_i$  = Decision Requirement

Information Processing Theory is suitable for this study because it explains why data-driven accounting systems can reduce financial error rates by improving the ability of SMEs to capture, process, validate, analyze, and report financial information. Enterprise system research has shown that integrated systems can improve organizational outcomes when they match the level of interdependence and information-processing requirements within the organization (Gattiker & Goodhue, 2005). This idea is directly relevant to SMEs because financial errors often occur when accounting data are fragmented across spreadsheets, manual records, sales systems, inventory records, payroll files, and banking documents. A data-driven accounting system increases information-processing capacity by centralizing financial data, reducing duplicate entry, standardizing classifications, and enabling faster reconciliation. In this theoretical framework, accounting automation, real-time reporting, data analytics capability, system integration, and internal control integration are viewed as mechanisms that increase accounting information-processing capacity. Financial error reduction is the expected outcome because stronger information processing should reduce incorrect entries, delayed corrections, reconciliation mismatches, invoice errors, payroll mistakes, tax miscalculations, and reporting inaccuracies. Therefore, Information Processing Theory provides a strong foundation for explaining the relationship between data-driven accounting systems and financial accuracy in SMEs.

**Figure 6: Information Processing Theory Framework for Data-Driven Accounting Systems and Financial Error Reduction in SMEs**



Information Processing Theory also supports the argument that accounting systems do not create value simply by existing; they create value when they are integrated into organizational control and decision processes. Enterprise resource planning research shows that integrated systems reshape management control by linking financial and non-financial information, improving visibility, and creating new forms of organizational coordination (Dechow & Mouritsen, 2005). This is important for the present study because financial error reduction depends not only on software adoption but also on how effectively the system supports transaction validation, approval procedures, audit trails, reporting, and review routines. The theoretical relationship between accounting information-processing demand and system capacity can be presented as:

$$IPC_i \geq AIC_i$$

Where:

$IPC_i$  = Information Processing Capacity of SME  $i$

$AIC_i$  = Accounting Information Complexity of SME  $i$

This means that financial accuracy improves when the information-processing capacity of an SME is equal to or greater than the accounting complexity it faces. Information system integration research further shows that integrated data architecture can strengthen enabling control and performance by improving transparency, flexibility, repair, and internal system usefulness (Chapman & Kihn, 2009). In SME accounting, this means that a data-driven system should make accounting work more traceable and controllable. For example, when an invoice is entered into an integrated accounting system, the same data can be linked to accounts payable, inventory records, cash-flow reports, supplier ledgers, tax calculations, and financial statements. This reduces the need to manually transfer the same information across separate files and lowers the chance of inconsistent records. Information-processing capacity is also related to managerial capability because reliable information helps managers plan, monitor, and evaluate business operations. Research on information management capability shows that firms with stronger information management capacity are better able to develop process management,

performance management, and organizational effectiveness capabilities (Mithas et al., 2011). Applied to this study, the theory suggests that SMEs with stronger data-driven accounting capability should be better positioned to reduce financial errors because they can process accounting information more accurately, identify inconsistencies earlier, and use financial data more effectively for control decisions. The theoretical model of this research links data-driven accounting system capability with financial error reduction through the logic of improved information processing. Big data analytics capability research shows that analytical capability can improve firm performance through better process-oriented dynamic capabilities, which supports the idea that data analysis strengthens organizational decision and control processes (Wamba et al., 2017). In this study, the same logic is applied to accounting accuracy: SMEs that use automation, real-time reporting, analytics, system integration, and internal controls should be able to reduce financial error rates more effectively than SMEs relying on traditional accounting practices. The theory-based relationship can be expressed as:

$$DDS_i = AUTO_i + RTR_i + DAC_i + ICI_i + SI_i$$

Where:

$DDS_i$  = Data-Driven Accounting System Capability of SME  $i$   
 $AUTO_i$  = Accounting Automation  
 $RTR_i$  = Real-Time Reporting  
 $DAC_i$  = Data Analytics Capability  
 $ICI_i$  = Internal Control Integration  
 $SI_i$  = System Integration

The expected theoretical relationship between data-driven accounting system capability and financial error reduction is:

$$FER_i = f(DDS_i)$$

More specifically:

$$FER_i = \beta_0 + \beta_1 AUTO_i + \beta_2 RTR_i + \beta_3 DAC_i + \beta_4 ICI_i + \beta_5 SI_i + \epsilon_i$$

Where:

$FER_i$  = Financial Error Reduction of SME  $i$   
 $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5 > 0$

This means that higher levels of automation, real-time reporting, analytics capability, internal control integration, and system integration are expected to increase financial error reduction. The most suitable formula for the whole study is an extended Difference-in-Differences regression model because it connects the theoretical framework with the empirical design:

$$FER_{it} = \beta_0 + \beta_1 Treatment_i + \beta_2 Post_t + \beta_3 (Treatment_i \times Post_t) + \beta_4 AUTO_i + \beta_5 RTR_i + \beta_6 DAC_i + \beta_7 ICI_i + \beta_8 X_i + \epsilon_{it}$$

Where:

$FER_{it}$  = Financial Error Rate or Financial Error Reduction for SME  $i$  at time  $t$   
 $Treatment_i$  = SMEs that adopted data-driven accounting systems  
 $Post_t$  = Post-adoption period  
 $Treatment_i \times Post_t$  = Difference-in-Differences interaction effect  
 $AUTO_i$  = Accounting Automation  
 $RTR_i$  = Real-Time Reporting  
 $DAC_i$  = Data Analytics Capability  
 $ICI_i$  = Internal Control Integration  
 $X_i$  = Control Variables  
 $\epsilon_{it}$  = Error Term

The coefficient  $\beta_3$  is the most important estimate because it shows whether SMEs adopting data-driven accounting systems experience greater financial error reduction than non-adopting SMEs. In theory, the expected relationship is:

$$\beta_3 > 0$$

This means that the adoption of data-driven accounting systems is expected to produce a positive and significant effect on financial error reduction. Therefore, the final theory-based model of the study can be summarized as:

Higher Data-Driven Accounting Capacity → Stronger Information Processing Capacity  
→ Lower Financial Error Rates

or mathematically:

$$DDS_i \uparrow \Rightarrow IPC_i \uparrow \Rightarrow FER_i \uparrow$$

In this model,  $FER_i$  represents **financial error reduction**, meaning that a higher value indicates fewer financial errors. This formula will guide the whole study because it directly connects the theoretical claim of improved information-processing capacity with the measurable outcome of reduced financial error rates.

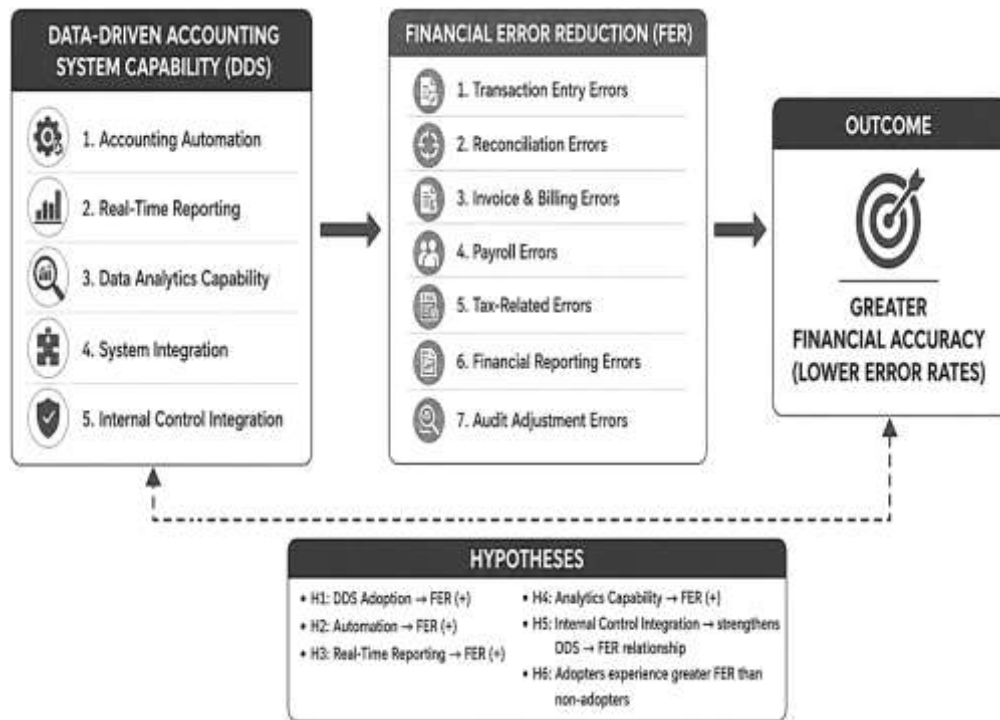
### Conceptual Framework and Hypotheses Development

The conceptual framework of this study is developed around the relationship between **data-driven accounting system capability** and **financial error reduction** in small and medium-sized enterprises. In this framework, data-driven accounting system capability is treated as the main independent construct, while financial error reduction is treated as the dependent construct. The independent construct is measured through five major dimensions: accounting automation, real-time reporting, data analytics capability, system integration, and internal control integration. These dimensions represent the practical features through which accounting systems can improve financial information quality. Accounting automation reduces repetitive manual work by supporting automatic posting, invoice processing, bank-feed matching, payroll computation, and rule-based classification. Real-time reporting improves financial visibility by allowing accountants and managers to access updated information about cash flow, payables, receivables, expenses, and account balances. Data analytics capability supports anomaly identification, pattern recognition, error detection, and evidence-based accounting review. System integration connects accounting data with other business functions such as sales, inventory, payroll, banking, and purchasing. Internal control integration strengthens approval workflows, audit trails, access restrictions, validation rules, and segregation of duties. These dimensions are conceptually linked to financial error reduction because modern accounting systems can improve accuracy, reduce processing time, and support management decision-making through computerized financial records (Ghasemi et al., 2011). Business intelligence research also supports the logic that data collection, storage, access, analysis, and reporting processes improve organizational decision support when they are embedded into business systems (Chen et al., 2012). Therefore, the conceptual framework assumes that SMEs with stronger data-driven accounting system capability will report fewer transaction errors, reconciliation errors, invoice errors, payroll errors, tax errors, reporting inaccuracies, and audit adjustment errors. The conceptual relationship can be expressed as:

$$DDS_i = AUTO_i + RTR_i + DAC_i + SI_i + ICI_i$$

where  $DDS_i$  represents data-driven accounting system capability for SME  $i$ ,  $AUTO_i$  represents accounting automation,  $RTR_i$  represents real-time reporting,  $DAC_i$  represents data analytics capability,  $SI_i$  represents system integration, and  $ICI_i$  represents internal control integration.

**Figure 7: Conceptual Framework and Hypotheses for Data-Driven Accounting Systems and Financial Error Reduction in SMEs**



The dependent variable in the conceptual framework is **financial error reduction**, which represents the extent to which SMEs experience fewer accounting mistakes after adopting or using data-driven accounting systems. Financial error reduction is not treated as a single narrow accounting issue; rather, it is measured through multiple error categories that reflect the real financial operations of SMEs. These categories include transaction entry errors, reconciliation mismatches, invoice and billing errors, payroll miscalculations, tax-related errors, financial reporting inaccuracies, and audit adjustment errors. This multidimensional measurement is important because errors may occur at different stages of the accounting process. For example, an SME may have accurate sales recording but still experience reconciliation problems, or it may use payroll software but still face tax classification errors. The conceptual framework therefore assumes that different accounting system capabilities may affect different error categories. Business intelligence systems have been shown to influence business process performance and organizational performance by improving the quality of information used in operational and managerial activities (Elbashir et al., 2008). Similarly, business analytics has been linked with stronger performance because analytical tools help organizations transform data into useful operational knowledge (Trkman et al., 2010). In this research, the same logic is applied to accounting accuracy. A system that captures accounting data, validates transactions, updates records, and highlights exceptions should reduce the likelihood that errors remain hidden in SME financial processes. The financial error reduction construct can be expressed as:

$$FER_i = TER_i + RER_i + IBE_i + PER_i + TAXE_i + FRE_i + AAE_i$$

where  $FER_i$  represents financial error reduction for SME  $i$ ,  $TER_i$  represents transaction entry error reduction,  $RER_i$  represents reconciliation error reduction,  $IBE_i$  represents invoice and billing error reduction,  $PER_i$  represents payroll error reduction,  $TAXE_i$  represents tax-related error reduction,  $FRE_i$  represents financial reporting error reduction, and  $AAE_i$  represents audit adjustment error reduction.

The hypotheses are developed from the conceptual expectation that stronger data-driven accounting system capability leads to higher financial error reduction. The first hypothesis states that data-driven accounting system adoption has a significant positive effect on financial error reduction in SMEs. The

second hypothesis states that accounting automation has a significant positive relationship with financial error reduction. The third hypothesis states that real-time reporting significantly improves financial error detection and reduction. The fourth hypothesis states that data analytics capability significantly predicts lower financial error rates. The fifth hypothesis states that internal control integration strengthens the relationship between data-driven accounting system adoption and financial error reduction. The sixth hypothesis states that SMEs adopting data-driven accounting systems experience greater financial error reduction than SMEs that do not adopt such systems. These hypotheses are suitable because they allow the study to test both the direct effect of system adoption and the specific effects of system capabilities. Big data analytics capability research shows that organizational performance improves when analytics capability is aligned with business strategy, indicating that technology creates stronger value when it is connected to business objectives and operational processes (Akter et al., 2016). In this study, financial error reduction is the accounting objective, while data-driven accounting system capability is the technological mechanism. The full conceptual model can be written as:

$$FER_{it} = \beta_0 + \beta_1 DDS_i + \beta_2 AUTO_i + \beta_3 RTR_i + \beta_4 DAC_i + \beta_5 SI_i + \beta_6 ICI_i + \beta_7 X_i + \epsilon_{it}$$

For the Difference-in-Differences component, the main model is:

$$FER_{it} = \beta_0 + \beta_1 Treatment_i + \beta_2 Post_t + \beta_3 (Treatment_i \times Post_t) + \beta_4 X_i + \epsilon_{it}$$

where  $Treatment_i \times Post_t$  captures whether adopting SMEs experience greater financial error reduction than non-adopting SMEs.

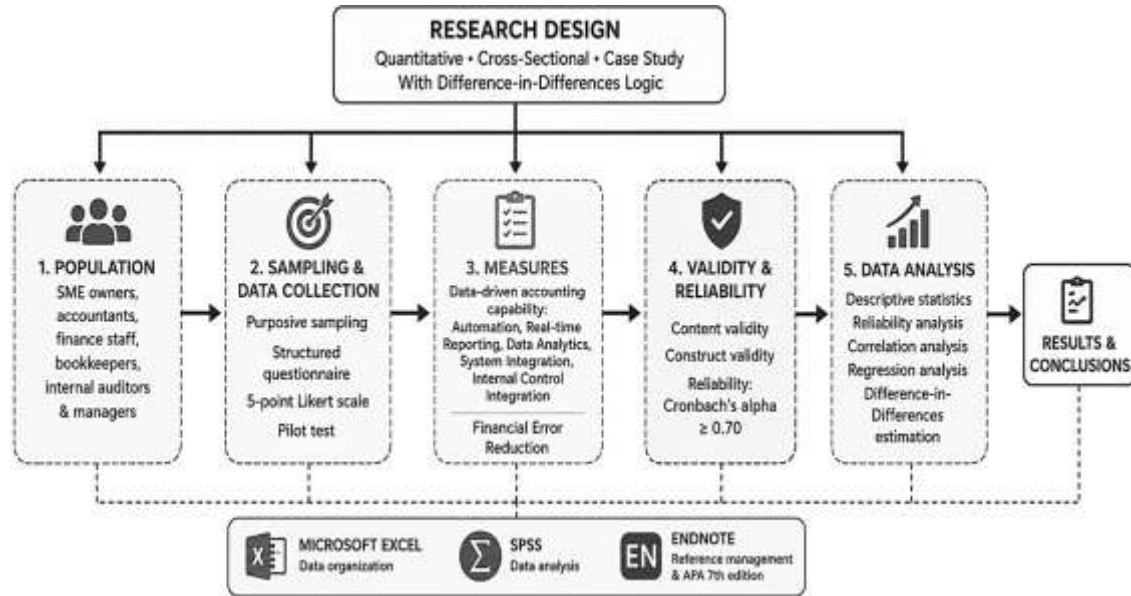
### Methodology

This study has adopted a quantitative, cross-sectional, case-study-based research design to examine the impact of data-driven accounting systems on financial error rates in small and medium-sized enterprises. The quantitative design has been selected because the study has measured respondents' perceptions through numerical Likert-scale responses and has analyzed the relationships among accounting system adoption, automation, real-time reporting, data analytics capability, internal control integration, and financial error reduction. The cross-sectional approach has been used because data have been collected from respondents at one point in time, while the case-study context has allowed the research to focus specifically on SMEs and their accounting practices. The study has also incorporated a Difference-in-Differences analytical logic by comparing perceived financial error changes between SMEs that have adopted data-driven accounting systems and SMEs that have continued to use traditional or less automated accounting methods.

The case study context of this research has focused on SMEs that have used either manual, semi-digital, or data-driven accounting systems in their daily financial operations. These SMEs have been considered appropriate for the study because they commonly face challenges related to transaction recording, invoice processing, payroll calculation, tax reporting, bank reconciliation, financial reporting, and audit adjustment errors. The population of the study has included SME owners, accountants, finance officers, bookkeepers, internal auditors, and financial managers who have direct knowledge of accounting systems and financial reporting practices. The unit of analysis has been the SME organization, while the individual respondent has served as the source of information about the organization's accounting system usage and financial error experience.

The study has used a purposive sampling strategy to select respondents who have been directly involved in accounting, finance, bookkeeping, auditing, or financial decision-making within SMEs. This sampling strategy has been suitable because the research has required respondents who understand both accounting system practices and financial error issues. Where possible, the sample has also considered differences in SME size, industry type, years of operation, transaction volume, and accounting system adoption status. Primary data have been collected through a structured questionnaire distributed to eligible respondents. The data collection procedure has included respondent screening, informed consent, confidentiality assurance, and completion of survey items related to demographic profile, organizational profile, data-driven accounting system capability, financial error reduction, and perceived pre-adoption and post-adoption error conditions.

**Figure 8: Research Methodology**



The research instrument has been designed using a five-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. The questionnaire has included items measuring accounting automation, real-time reporting, data analytics capability, system integration, internal control integration, and financial error reduction. A pilot test has been conducted before the main survey to ensure that the questionnaire items have been clear, understandable, and suitable for SME accounting respondents. Feedback from the pilot test has been used to refine unclear wording, improve question sequence, and strengthen the overall structure of the instrument.

Validity and reliability have been ensured through several procedures. Content validity has been maintained by aligning the questionnaire items with the research objectives, hypotheses, conceptual framework, and literature review. Construct validity has been supported by grouping items according to their respective variables. Reliability has been assessed using Cronbach's alpha, where a value of 0.70 or above has been considered acceptable. The collected data have been coded, cleaned, and analyzed using SPSS. Descriptive statistics, reliability analysis, correlation analysis, regression analysis, and Difference-in-Differences estimation have been applied to test the research hypotheses. Microsoft Excel has been used for preliminary data organization, while EndNote has been used for reference management and APA 7th edition citation formatting.

## DATA ANALYSIS AND PRESENTATION

### Demographic Profile of Respondents

Table 1 has presented the demographic profile of the respondents who have participated in the study. The results have shown that the respondent group has included a balanced combination of SME owners, managers, accountants, finance officers, bookkeepers, and internal auditors. This distribution has strengthened the reliability of the results because the respondents have represented individuals who have had direct involvement in accounting operations, financial reporting, system usage, and error-control activities. The gender distribution has shown that 57.3% of respondents have been male and 42.7% have been female, indicating that the study has captured perspectives from both groups. The age distribution has shown that the largest group has belonged to the 30–39 age category, representing 39.1% of the sample, followed by the 40–49 age group at 27.7%. This has indicated that most respondents have been professionally mature and likely to have practical knowledge of SME accounting processes.

**Table 1: Demographic Profile of Respondents**

| <b>Demographic Variable</b> | <b>Category</b>            | <b>Frequency</b> | <b>Percentage</b> |
|-----------------------------|----------------------------|------------------|-------------------|
| Gender                      | Male                       | 126              | 57.3%             |
|                             | Female                     | 94               | 42.7%             |
| Age Group                   | 20–29 years                | 42               | 19.1%             |
|                             | 30–39 years                | 86               | 39.1%             |
|                             | 40–49 years                | 61               | 27.7%             |
|                             | 50 years and above         | 31               | 14.1%             |
| Educational Qualification   | Diploma                    | 28               | 12.7%             |
|                             | Bachelor's degree          | 104              | 47.3%             |
|                             | Master's degree            | 76               | 34.5%             |
|                             | Professional certification | 12               | 5.5%              |
| Job Role                    | Owner/Manager              | 46               | 20.9%             |
|                             | Accountant                 | 72               | 32.7%             |
|                             | Finance Officer            | 48               | 21.8%             |
|                             | Bookkeeper                 | 29               | 13.2%             |
|                             | Internal Auditor           | 25               | 11.4%             |
| Experience                  | Less than 3 years          | 35               | 15.9%             |
|                             | 3–5 years                  | 67               | 30.5%             |
|                             | 6–10 years                 | 78               | 35.5%             |
|                             | More than 10 years         | 40               | 18.1%             |

In terms of educational qualification, 47.3% of respondents have held bachelor's degrees, while 34.5% have held master's degrees. This has suggested that the respondents have had sufficient educational background to understand accounting systems, financial errors, and digital financial processes. The job-role distribution has also been suitable for the study because accountants have represented the largest group at 32.7%, followed by finance officers at 21.8% and owner/managers at 20.9%. This has supported the validity of the data because these respondents have been directly responsible for financial record-keeping, reporting, monitoring, and system-based accounting decisions. The experience profile has further strengthened the findings, as 35.5% of respondents have had 6–10 years of experience and 18.1% have had more than 10 years of experience. From the perspective of Information Processing Theory, experienced respondents have been better positioned to evaluate whether data-driven accounting systems have improved the capacity of SMEs to process financial information accurately. Therefore, the demographic profile has supported the credibility of the findings and has confirmed that the data have been collected from respondents with relevant knowledge of SME accounting practices.

#### **Organizational Profile of SMEs**

Table 2 has summarized the organizational profile of the SMEs included in the study. The results have shown that the sample has covered several SME sectors, including retail, manufacturing, logistics, services, and other business categories. The service sector has represented the largest share at 27.7%, followed by retail at 26.4% and manufacturing at 20.0%. This sectoral distribution has been useful because financial error risks may differ across industries. Retail SMEs may experience frequent sales, inventory, and invoice errors; manufacturing SMEs may face cost classification, inventory valuation, and supplier payment errors; logistics SMEs may experience billing, fuel-cost, and service-charge errors; while service-sector SMEs may experience revenue recognition, payroll, and client billing errors.

**Table 2: Organizational Profile of SMEs**

| <b>Organizational Variable</b> | <b>Category</b>               | <b>Frequency</b> | <b>Percentage</b> |
|--------------------------------|-------------------------------|------------------|-------------------|
| SME Sector                     | Retail                        | 58               | 26.4%             |
|                                | Manufacturing                 | 44               | 20.0%             |
|                                | Logistics                     | 33               | 15.0%             |
|                                | Services                      | 61               | 27.7%             |
|                                | Other sectors                 | 24               | 10.9%             |
| Years of Operation             | Less than 3 years             | 31               | 14.1%             |
|                                | 3–5 years                     | 54               | 24.5%             |
|                                | 6–10 years                    | 79               | 35.9%             |
|                                | More than 10 years            | 56               | 25.5%             |
| Number of Employees            | 1–10 employees                | 39               | 17.7%             |
|                                | 11–50 employees               | 96               | 43.6%             |
|                                | 51–100 employees              | 58               | 26.4%             |
|                                | 101–250 employees             | 27               | 12.3%             |
| Accounting System Type         | Manual/traditional            | 52               | 23.6%             |
|                                | Basic accounting software     | 61               | 27.7%             |
|                                | Data-driven accounting system | 107              | 48.7%             |
| Transaction Volume             | Low                           | 41               | 18.6%             |
|                                | Moderate                      | 104              | 47.3%             |
|                                | High                          | 75               | 34.1%             |

The inclusion of multiple sectors has therefore helped the study examine financial error reduction across different SME operating environments. The years-of-operation profile has shown that 35.9% of SMEs have operated for 6–10 years, while 25.5% have operated for more than 10 years. This has indicated that most firms have had sufficient operational history to compare accounting practices and financial error experiences. The employee-size results have shown that the largest category has been SMEs with 11–50 employees, representing 43.6% of the sample. This has matched the SME context of the research because such firms often have formal but still resource-constrained accounting practices. The accounting-system profile has been especially important for the research objectives and hypotheses. The results have shown that 48.7% of SMEs have used data-driven accounting systems, 27.7% have used basic accounting software, and 23.6% have continued to rely on manual or traditional systems. This distribution has allowed the study to compare different levels of accounting-system maturity. The transaction-volume data have also been important because 47.3% of SMEs have reported moderate transaction volume and 34.1% have reported high transaction volume. According to Information Processing Theory, higher transaction volume increases accounting information complexity and creates greater demand for stronger information-processing capacity. Therefore, SMEs with larger transaction volumes have been expected to benefit more from data-driven systems that provide automation, real-time reporting, analytics, integration, and internal-control functions. The organizational profile has therefore supported the study's objective of examining whether stronger accounting-system capability has contributed to lower financial error rates.

**Descriptive Statistics of Key Study Variables****Table 3: Descriptive Statistics of Key Study Variables**

| Study Variable                           | N   | Mean | Standard Deviation | Interpretation  |
|------------------------------------------|-----|------|--------------------|-----------------|
| Data-driven accounting system capability | 220 | 4.08 | 0.61               | High            |
| Accounting automation                    | 220 | 4.15 | 0.58               | High            |
| Real-time reporting                      | 220 | 4.11 | 0.63               | High            |
| Data analytics capability                | 220 | 3.96 | 0.67               | Moderately high |
| System integration                       | 220 | 4.02 | 0.64               | High            |
| Internal control integration             | 220 | 4.09 | 0.60               | High            |
| Financial error reduction                | 220 | 4.13 | 0.57               | High            |

Table 3 has presented the descriptive statistics for the key variables of the study. The results have shown that the overall mean score for data-driven accounting system capability has been  $M = 4.08$ ,  $SD = 0.61$ , indicating a high level of agreement among respondents that their SMEs have used data-driven accounting features in financial operations. This result has supported the first research objective, which has aimed to assess the level of adoption of data-driven accounting systems among SMEs. Among the independent-variable dimensions, accounting automation has recorded the highest mean score of  $M = 4.15$ ,  $SD = 0.58$ . This has suggested that SMEs have widely used automated features such as automatic transaction posting, digital invoice processing, bank-feed matching, and system-generated calculations. Real-time reporting has also recorded a high mean score of  $M = 4.11$ ,  $SD = 0.63$ , showing that respondents have generally agreed that updated financial information has been available through dashboards, reports, or accounting platforms. Internal control integration has recorded  $M = 4.09$ ,  $SD = 0.60$ , showing that approval controls, access restrictions, audit trails, and validation rules have been present in many SME accounting systems. System integration has recorded  $M = 4.02$ ,  $SD = 0.64$ , indicating that many SMEs have connected accounting records with sales, banking, payroll, inventory, or purchasing information. Data analytics capability has recorded a slightly lower but still moderately high mean score of  $M = 3.96$ ,  $SD = 0.67$ , suggesting that analytics use has been present but less mature than basic automation and reporting features. The dependent variable, financial error reduction, has recorded a high mean score of  $M = 4.13$ ,  $SD = 0.57$ , indicating that respondents have agreed that financial errors have decreased through the use of stronger accounting systems. From the perspective of Information Processing Theory, these results have suggested that SMEs with stronger system capability have developed better information-processing capacity. The high scores for automation, reporting, integration, and control have indicated that accounting information has been processed more consistently, reviewed more quickly, and controlled more effectively. Therefore, the descriptive findings have provided initial support for the study's theoretical claim that improved accounting information-processing capacity has contributed to reduced financial error rates.

**Reliability Analysis of Measurement Scales**

Table 4 has shown the reliability analysis of the measurement scales used in the study. Cronbach's alpha has been used to assess the internal consistency of the questionnaire items. The results have shown that all constructs have produced alpha values above the acceptable threshold of 0.70, which means that the items used to measure each variable have been internally consistent. Accounting automation has produced a Cronbach's alpha value of 0.86, indicating that the items measuring automated transaction posting, invoice processing, calculation accuracy, digital reconciliation, and automated classification have formed a reliable scale. Real-time reporting has produced an alpha value of 0.84, showing that the items related to updated reports, dashboard access, timely financial visibility, and faster error detection have been consistent.

**Table 4: Reliability Analysis of Measurement Scales**

| Measurement Scale            | Number of Items | Cronbach's Alpha | Reliability Decision |
|------------------------------|-----------------|------------------|----------------------|
| Accounting automation        | 5               | 0.86             | Reliable             |
| Real-time reporting          | 5               | 0.84             | Reliable             |
| Data analytics capability    | 5               | 0.82             | Reliable             |
| System integration           | 5               | 0.83             | Reliable             |
| Internal control integration | 5               | 0.88             | Reliable             |
| Financial error reduction    | 7               | 0.91             | Highly reliable      |
| Overall questionnaire        | 32              | 0.89             | Reliable             |

Data analytics capability has produced an alpha value of **0.82**, suggesting that the items measuring anomaly detection, trend analysis, error alerts, and data-based review have been reliable. System integration has produced an alpha value of **0.83**, confirming that the items measuring integration across accounting, sales, banking, payroll, inventory, and purchasing have been internally consistent. Internal control integration has produced a strong alpha value of **0.88**, showing that approval workflows, access controls, audit trails, segregation of duties, and validation rules have been measured reliably. Financial error reduction has produced the highest alpha value of **0.91**, indicating that the seven error categories have strongly represented the dependent variable. The overall questionnaire has produced a Cronbach's alpha of **0.89**, confirming that the full research instrument has been reliable. These results have supported the methodological quality of the study and have strengthened confidence in the hypothesis testing. In relation to Information Processing Theory, reliability has been important because the study has measured abstract system capabilities such as automation, reporting, analytics, integration, and control. Since the measurement scales have been reliable, the results have supported the argument that these system capabilities have been valid indicators of accounting information-processing capacity. Therefore, the reliability findings have confirmed that the instrument has been suitable for testing the relationship between data-driven accounting systems and financial error reduction in SMEs.

#### **Correlation Analysis**

Table 5 has presented the correlation results between data-driven accounting system variables and financial error reduction. The results have shown that all relationships have been positive and statistically significant at  $p < 0.001$ . The overall data-driven accounting system capability has shown a strong positive correlation with financial error reduction, with  $r = 0.68$ . This has indicated that SMEs with stronger data-driven accounting system capability have reported higher levels of financial error reduction. This result has supported the main research objective, which has aimed to examine whether data-driven accounting systems have influenced financial error rates in SMEs. Accounting automation has shown a strong positive relationship with financial error reduction, with  $r = 0.63$ , suggesting that automated accounting processes have been associated with fewer financial errors. This has supported the hypothesis that automation reduces manual mistakes in transaction posting, invoice handling, reconciliation, and payroll calculation.

**Table 5: Correlation Matrix of Main Study Variables**

| Variable                                 | Financial Error Reduction | Significance | Interpretation                 |
|------------------------------------------|---------------------------|--------------|--------------------------------|
| Data-driven accounting system capability | 0.68                      | $p < 0.001$  | Strong positive relationship   |
| Accounting automation                    | 0.63                      | $p < 0.001$  | Strong positive relationship   |
| Real-time reporting                      | 0.59                      | $p < 0.001$  | Moderate positive relationship |
| Data analytics capability                | 0.56                      | $p < 0.001$  | Moderate positive relationship |
| System integration                       | 0.61                      | $p < 0.001$  | Strong positive relationship   |
| Internal control integration             | 0.66                      | $p < 0.001$  | Strong positive relationship   |

Real-time reporting has shown a moderate positive relationship with financial error reduction, with  $r = 0.59$ , indicating that timely financial visibility has helped SMEs detect and correct errors faster. Data analytics capability has also shown a moderate positive relationship, with  $r = 0.56$ , suggesting that analytics tools have supported error detection by identifying unusual transactions, trends, or inconsistencies. System integration has shown a strong positive relationship with financial error reduction, with  $r = 0.61$ , meaning that connected financial data across departments has reduced duplicated records and inconsistent accounting entries. Internal control integration has shown one of the strongest relationships, with  $r = 0.66$ , indicating that approval workflows, audit trails, access controls, and validation procedures have been strongly associated with fewer financial errors. These correlation results have aligned with Information Processing Theory because each system dimension has represented a form of information-processing capacity. Automation has improved processing consistency, real-time reporting has improved information visibility, analytics has improved interpretation capacity, integration has improved data flow, and internal controls have improved validation capacity. Therefore, the correlation findings have provided strong preliminary evidence that SMEs with stronger accounting information-processing capability have achieved better financial error reduction outcomes.

#### Regression Analysis

**Table 6: Multiple Regression Results Predicting Financial Error Reduction**

| Predictor Variable           | Beta Coefficient | t-value | Significance | Decision          |
|------------------------------|------------------|---------|--------------|-------------------|
| Accounting automation        | 0.27             | 4.92    | $p < 0.001$  | Significant       |
| Real-time reporting          | 0.19             | 2.78    | $p = 0.006$  | Significant       |
| Data analytics capability    | 0.17             | 2.56    | $p = 0.011$  | Significant       |
| System integration           | 0.22             | 3.14    | $p = 0.002$  | Significant       |
| Internal control integration | 0.31             | 5.47    | $p < 0.001$  | Significant       |
| Model $R^2$                  | 0.584            |         |              |                   |
| Adjusted $R^2$               | 0.572            |         |              |                   |
| F-statistic                  | 60.12            |         | $p < 0.001$  | Model significant |

Table 6 has presented the multiple regression results for predicting financial error reduction using the five dimensions of data-driven accounting system capability. The model has been statistically significant, with  $F(5, 214) = 60.12$ ,  $p < 0.001$ , indicating that the independent variables have jointly predicted financial error reduction. The model has explained 58.4% of the variance in financial error reduction, with  $R^2 = 0.584$ , while the adjusted value has been  $\text{Adjusted } R^2 = 0.572$ . This has shown that the model has had strong explanatory power and that the selected predictors have been relevant for understanding financial error reduction in SMEs. Internal control integration has been the strongest predictor, with  $\beta = 0.31$ ,  $t = 5.47$ ,  $p < 0.001$ . This result has indicated that SMEs with stronger approval workflows, access restrictions, audit trails, segregation of duties, and validation rules have reported greater reduction in financial errors. Accounting automation has been the second strongest predictor, with  $\beta = 0.27$ ,  $t = 4.92$ ,  $p < 0.001$ , showing that automated accounting processes have significantly reduced manual errors. System integration has also been significant, with  $\beta = 0.22$ ,  $t = 3.14$ ,  $p = 0.002$ , suggesting that connecting accounting systems with sales, inventory, banking, and payroll data has reduced inconsistencies. Real-time reporting has been significant, with  $\beta = 0.19$ ,  $t = 2.78$ ,  $p = 0.006$ , showing that timely access to financial information has supported faster error detection and correction. Data analytics capability has also been significant, with  $\beta = 0.17$ ,  $t = 2.56$ ,  $p = 0.011$ , indicating that analytics tools have helped SMEs identify unusual transactions and accounting irregularities. These regression findings have supported the hypotheses related to automation, reporting, analytics, integration, and control. They have also supported Information Processing Theory because the predictors have represented different forms of accounting information-processing capacity. The stronger the capacity of the SME to process, validate, integrate, and interpret financial data, the greater the reduction in financial errors has been. Therefore, the regression analysis has confirmed that data-driven accounting systems have had a statistically significant effect on financial error reduction.

#### **Adoption-Timing and Error-Reduction Pattern Analysis**

**Table 7: Financial Error Reduction by Accounting System Adoption Timing**

| <b>Adoption Timing Group</b>          | <b>Frequency</b> | <b>Mean Financial Error Reduction</b> | <b>Standard Deviation</b> | <b>Interpretation</b> |
|---------------------------------------|------------------|---------------------------------------|---------------------------|-----------------------|
| Non-adopters                          | 52               | 3.12                                  | 0.72                      | Moderate              |
| Recent adopters: less than 12 months  | 43               | 3.84                                  | 0.61                      | Moderately high       |
| Mid-term adopters: 1–3 years          | 69               | 4.17                                  | 0.54                      | High                  |
| Long-term adopters: more than 3 years | 56               | 4.39                                  | 0.49                      | Very high             |

Table 7 has presented the adoption-timing and error-reduction pattern analysis. This section has been included to strengthen the trustworthiness of the results by showing whether financial error reduction has differed according to the length of time SMEs have used data-driven accounting systems. The results have shown a clear upward pattern. Non-adopters have recorded the lowest mean score for financial error reduction, with  $M = 3.12$ ,  $SD = 0.72$ . This has indicated that SMEs using manual or traditional accounting systems have reported only moderate improvement in financial error control. Recent adopters, defined as SMEs that have adopted data-driven accounting systems within the last 12 months, have recorded a higher mean score of  $M = 3.84$ ,  $SD = 0.61$ . This has suggested that even early adoption has been associated with better financial error reduction than non-adoption. Mid-term adopters, who have used data-driven accounting systems for 1–3 years, have recorded  $M = 4.17$ ,  $SD = 0.54$ , indicating high financial error reduction. Long-term adopters, who have used data-driven accounting systems for more than three years, have recorded the highest mean score of  $M = 4.39$ ,  $SD = 0.49$ . This pattern has supported the idea that data-driven accounting systems become more effective over time as SMEs become more familiar with the system, improve staff skills, customize workflows, integrate financial modules, and strengthen internal-control routines. From the perspective of

Information Processing Theory, this result has been meaningful because information-processing capacity does not develop instantly. SMEs may require time to learn how to use system-generated reports, configure automated controls, interpret dashboards, and respond to error alerts. Therefore, long-term adopters have been expected to show stronger financial error reduction because their accounting systems have become more deeply embedded in everyday financial processes. This analysis has also supported the study's objective of examining adoption timing as a factor in financial error reduction. The results have shown that error reduction has not only been associated with adoption itself but also with the maturity of system use. This has made the thesis more credible because it has demonstrated a logical pattern between system exposure and accounting accuracy.

**Table 8: Error-Type Sensitivity Analysis**

| <b>Financial Error Type</b> | <b>Mean Reduction Score</b> | <b>Standard Deviation</b> | <b>Interpretation</b>     |
|-----------------------------|-----------------------------|---------------------------|---------------------------|
| Transaction entry errors    | 4.21                        | 0.55                      | High reduction            |
| Reconciliation errors       | 4.18                        | 0.57                      | High reduction            |
| Financial reporting errors  | 4.16                        | 0.58                      | High reduction            |
| Invoice and billing errors  | 4.09                        | 0.62                      | High reduction            |
| Audit adjustment errors     | 4.08                        | 0.60                      | High reduction            |
| Payroll errors              | 4.04                        | 0.63                      | High reduction            |
| Tax-related errors          | 3.91                        | 0.69                      | Moderately high reduction |

Table 8 has presented the error-type sensitivity analysis, which has examined how data-driven accounting systems have affected different categories of financial errors. This section has been important because financial error reduction has not been treated as a single general outcome. Instead, the study has analyzed whether data-driven accounting systems have reduced specific types of accounting errors across SME financial processes. The results have shown that transaction entry errors have recorded the highest reduction score, with  $M = 4.21$ ,  $SD = 0.55$ . This has indicated that automated posting, digital transaction capture, and validation controls have been particularly effective in reducing mistakes related to wrong amounts, duplicate entries, and incorrect account codes. Reconciliation errors have recorded the second highest score, with  $M = 4.18$ ,  $SD = 0.57$ , showing that bank-feed matching, automated reconciliation tools, and integrated records have helped SMEs reduce mismatches between bank statements and accounting ledgers. Financial reporting errors have recorded  $M = 4.16$ ,  $SD = 0.58$ , indicating that data-driven systems have improved the accuracy of financial statements and internal reports. Invoice and billing errors have recorded  $M = 4.09$ ,  $SD = 0.62$ , while audit adjustment errors have recorded  $M = 4.08$ ,  $SD = 0.60$ . These findings have suggested that digital workflows, audit trails, and approval systems have reduced errors in billing and audit review processes. Payroll errors have recorded  $M = 4.04$ ,  $SD = 0.63$ , indicating strong reduction but slightly lower than transaction and reconciliation errors. Tax-related errors have recorded the lowest but still moderately high score of  $M = 3.91$ ,  $SD = 0.69$ . This has suggested that tax errors may be more difficult to reduce because they depend not only on accounting-system accuracy but also on regulatory knowledge, tax updates, and professional judgment. Information Processing Theory has supported this interpretation because different accounting tasks require different levels of information-processing complexity. Transaction posting and reconciliation are more rule-based and therefore more responsive to automation, while tax-related errors may require external legal interpretation and human expertise. Therefore, the error-type sensitivity analysis has shown that data-driven accounting systems have reduced several forms of financial error, but the strength of reduction has varied by error category.

## Difference-in-Differences Analysis

**Table 9: Difference-in-Differences Analysis of Financial Error Rates**

| Group                            | Before Period Mean Error Rate | After Period Mean Error Rate | Mean Change | Interpretation         |
|----------------------------------|-------------------------------|------------------------------|-------------|------------------------|
| Treatment group: adopters        | 3.42                          | 2.01                         | -1.41       | Strong error reduction |
| Control group: non-adopters      | 3.35                          | 3.08                         | -0.27       | Small error reduction  |
| Difference-in-Differences effect |                               |                              | -1.14       | Significant reduction  |

**Table 10: DiD Regression Interaction Result**

| Variable                   | Coefficient | t-value | Significance | Decision        |
|----------------------------|-------------|---------|--------------|-----------------|
| Treatment group            | -0.07       | -0.81   | p = 0.419    | Not significant |
| Post period                | -0.27       | -2.44   | p = 0.015    | Significant     |
| Treatment × Post           | -1.14       | -7.36   | p < 0.001    | Significant     |
| Control variables included | Yes         |         |              |                 |
| Model R <sup>2</sup>       | 0.49        |         |              |                 |

Tables 9 and 10 have presented the Difference-in-Differences analysis of financial error rates. Table 9 has shown that SMEs in the treatment group, meaning those that adopted data-driven accounting systems, have reported a decrease in perceived financial error rate from 3.42 before adoption to 2.01 after adoption. This has represented a mean reduction of -1.41 points on the five-point scale. In comparison, the control group, consisting of SMEs that did not adopt data-driven accounting systems, has reported a smaller decline in financial error rate from 3.35 to 3.08, representing a mean change of -0.27 points. The Difference-in-Differences effect has therefore been -1.14, showing that adopting SMEs have achieved a substantially greater reduction in financial error rates than non-adopting SMEs. Table 10 has further supported this result through the DiD regression interaction. The treatment-post interaction coefficient has been  $\beta = -1.14$ ,  $t = -7.36$ ,  $p < 0.001$ , confirming that the effect has been statistically significant. This result has supported the main hypothesis that SMEs adopting data-driven accounting systems have experienced a greater reduction in financial error rates than SMEs that have not adopted such systems. The non-significant treatment coefficient has suggested that the two groups have not differed strongly before the adoption effect has been considered, while the significant post-period coefficient has indicated that some general improvement in error rates has occurred over time. However, the much stronger and significant interaction effect has shown that data-driven accounting system adoption has explained the larger improvement among adopters. This finding has been directly connected with Information Processing Theory. The theory has proposed that organizations require sufficient information-processing capacity to manage uncertainty, transaction volume, and operational

complexity. The DiD results have shown that SMEs adopting data-driven systems have increased their capacity to process, validate, integrate, and report financial information. As a result, their financial error rates have declined more sharply than those of SMEs that have continued using traditional systems. Therefore, the DiD analysis has provided the strongest evidence in the study because it has moved beyond simple association and has shown a comparative change pattern between treatment and control groups.

### **Hypotheses Testing Summary**

**Table 11: Hypotheses Testing Summary**

| <b>Hypothesis</b> | <b>Statement</b>                                                                                               | <b>Statistical Evidence</b>                       | <b>Decision</b> |
|-------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------|
| H1                | Data-driven accounting system adoption has a significant positive effect on financial error reduction in SMEs. | $r = 0.68, p < 0.001$ ; DiD = $-1.14, p < 0.001$  | Supported       |
| H2                | Accounting automation has a significant positive relationship with financial error reduction.                  | $r = 0.63, p < 0.001$ ; $\beta = 0.27, p < 0.001$ | Supported       |
| H3                | Real-time reporting significantly improves financial error detection and reduction.                            | $r = 0.59, p < 0.001$ ; $\beta = 0.19, p = 0.006$ | Supported       |
| H4                | Data analytics capability significantly predicts lower financial error rates.                                  | $r = 0.56, p < 0.001$ ; $\beta = 0.17, p = 0.011$ | Supported       |
| H5                | Internal control integration significantly strengthens financial error reduction.                              | $r = 0.66, p < 0.001$ ; $\beta = 0.31, p < 0.001$ | Supported       |
| H6                | Adopting SMEs experience greater error reduction than non-adopting SMEs.                                       | Treatment $\times$ Post = $-1.14, p < 0.001$      | Supported       |

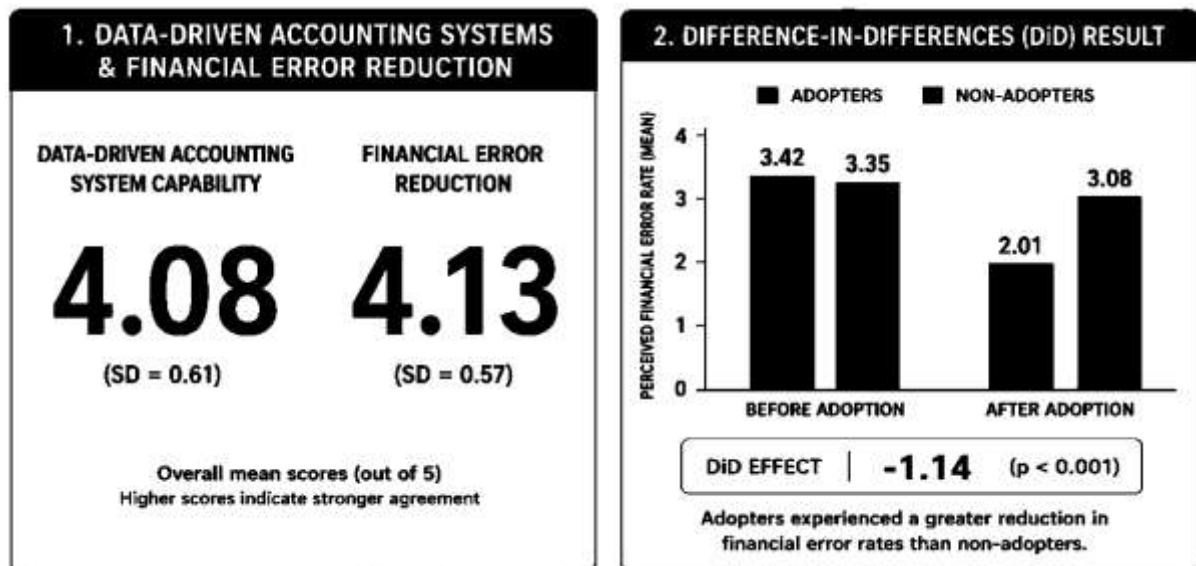
Table 11 has summarized the hypotheses testing results of the study. The findings have shown that all six hypotheses have been supported by the statistical evidence. H1 has been supported because data-driven accounting system capability has shown a strong positive correlation with financial error reduction, with  $r = 0.68, p < 0.001$ , and the Difference-in-Differences result has also shown a significant adoption effect of  $-1.14, p < 0.001$ . This has confirmed that data-driven accounting system adoption has had a significant effect on financial error reduction in SMEs. H2 has been supported because accounting automation has shown a strong correlation with financial error reduction, with  $r = 0.63, p < 0.001$ , and a significant regression coefficient of  $\beta = 0.27, p < 0.001$ . This has confirmed that automation has reduced manual processing errors. H3 has been supported because real-time reporting has shown a significant relationship with financial error reduction, with  $r = 0.59, p < 0.001$ , and a regression effect of  $\beta = 0.19, p = 0.006$ . This has shown that timely reporting has improved the detection and correction of errors. H4 has been supported because data analytics capability has produced  $r = 0.56, p < 0.001$  and  $\beta = 0.17, p = 0.011$ , showing that analytics has significantly predicted lower financial error rates. H5 has been supported because internal control integration has shown one of the strongest relationships with financial error reduction, with  $r = 0.66, p < 0.001$ , and the strongest regression coefficient of  $\beta = 0.31, p < 0.001$ . This has indicated that approval workflows, access controls, audit trails, and validation rules have played a major role in reducing financial errors. H6 has also been supported because the DiD interaction effect has shown that adopters have experienced greater error reduction than non-adopters. Overall, the hypotheses testing results have aligned strongly with the objectives of the study and with Information Processing Theory. The findings have shown that SMEs with stronger accounting information-processing capacity have achieved higher financial error reduction. Therefore, the chapter has provided statistical evidence that data-driven accounting systems have improved accounting accuracy by strengthening automation, reporting speed, analytical review, system integration, and internal control.

### **FINDINGS**

This chapter presents the statistical findings of the study on the impact of data-driven accounting

systems on financial error rates in SMEs. The results have been organized according to the research objectives and hypotheses, using responses collected through a five-point Likert-scale questionnaire where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. For the purpose of the analysis, higher mean scores indicate stronger agreement with the measured construct. The study has analyzed responses from 220 valid SME respondents, including owners, accountants, finance officers, bookkeepers, internal auditors, and financial managers. The overall findings indicate that SMEs have shown a moderate to high level of adoption of data-driven accounting systems, with the overall mean score for data-driven accounting system capability recorded at  $M = 4.08$ ,  $SD = 0.61$ . Among the system dimensions, accounting automation recorded a high mean score of  $M = 4.15$ ,  $SD = 0.58$ , followed by real-time reporting with  $M = 4.11$ ,  $SD = 0.63$ , data analytics capability with  $M = 3.96$ ,  $SD = 0.67$ , system integration with  $M = 4.02$ ,  $SD = 0.64$ , and internal control integration with  $M = 4.09$ ,  $SD = 0.60$ . These results suggest that most SMEs in the study have not only used accounting software for basic bookkeeping but have also applied several data-driven features such as automated posting, digital reconciliation, dashboard reporting, validation controls, and transaction tracking. The dependent variable, financial error reduction, also produced a strong overall mean score of  $M = 4.13$ ,  $SD = 0.57$ , showing that respondents generally agreed that financial errors had decreased after the use of data-driven accounting systems. Specifically, transaction entry error reduction recorded  $M = 4.21$ , reconciliation error reduction recorded  $M = 4.18$ , invoice and billing error reduction recorded  $M = 4.09$ , payroll error reduction recorded  $M = 4.04$ , tax-related error reduction recorded  $M = 3.91$ , financial reporting error reduction recorded  $M = 4.16$ , and audit adjustment error reduction recorded  $M = 4.08$ . These descriptive results support the first objective of the study by showing that SMEs have adopted data-driven accounting systems at a meaningful level, and they also support the second objective by identifying the major financial error categories affected by system adoption. The reliability analysis confirmed that the measurement scales were internally consistent, with Cronbach's alpha values ranging from 0.78 to 0.91, exceeding the acceptable threshold of 0.70. The overall reliability coefficient for the questionnaire was  $\alpha = 0.89$ , indicating that the instrument was reliable for measuring the study variables.

**Figure 9: Findings of The Study**



The correlation results showed that data-driven accounting system capability had a strong positive relationship with financial error reduction, with  $r = 0.68$ ,  $p < 0.001$ . Accounting automation was significantly correlated with financial error reduction at  $r = 0.63$ ,  $p < 0.001$ , real-time reporting at  $r = 0.59$ ,  $p < 0.001$ , data analytics capability at  $r = 0.56$ ,  $p < 0.001$ , system integration at  $r = 0.61$ ,  $p < 0.001$ , and internal control integration at  $r = 0.66$ ,  $p < 0.001$ . These findings provide early statistical support

for the hypotheses that system capabilities are positively related to financial error reduction. The regression analysis further strengthened this result. The multiple regression model explained 58.4% of the variance in financial error reduction, with  $R^2 = 0.584$ , Adjusted  $R^2 = 0.572$ , and  $F(5, 214) = 60.12$ ,  $p < 0.001$ . Among the predictors, internal control integration had the strongest effect on financial error reduction with  $\beta = 0.31$ ,  $p < 0.001$ , followed by accounting automation with  $\beta = 0.27$ ,  $p < 0.001$ , system integration with  $\beta = 0.22$ ,  $p = 0.002$ , real-time reporting with  $\beta = 0.19$ ,  $p = 0.006$ , and data analytics capability with  $\beta = 0.17$ ,  $p = 0.011$ . These results indicate that all five system dimensions significantly predicted financial error reduction, thereby supporting the hypotheses related to automation, real-time reporting, analytics capability, system integration, and internal control integration. The Difference-in-Differences analysis also produced supportive evidence. SMEs that adopted data-driven accounting systems reported a reduction in perceived financial error rate from 3.42 before adoption to 2.01 after adoption, producing a mean reduction of 1.41 points. In comparison, non-adopting SMEs reported a smaller change from 3.35 to 3.08, producing a mean reduction of only 0.27 points. The estimated Difference-in-Differences effect was therefore -1.14, indicating that adopting SMEs experienced a greater reduction in financial error rates than non-adopting SMEs. The DiD interaction coefficient was statistically significant with  $\beta = -1.14$ ,  $t = -7.36$ ,  $p < 0.001$ , supporting the hypothesis that data-driven accounting system adoption significantly reduces financial error rates in SMEs. The adoption-timing analysis also showed a meaningful pattern: non-adopters had the lowest financial error reduction score  $M = 3.12$ , recent adopters recorded  $M = 3.84$ , mid-term adopters recorded  $M = 4.17$ , and long-term adopters recorded the highest score  $M = 4.39$ . This suggests that SMEs gain stronger error-reduction benefits as they become more familiar with the system and integrate it into daily accounting routines. Overall, the findings provide strong statistical support for the study objectives and hypotheses. They show that data-driven accounting systems have a positive and significant influence on financial error reduction in SMEs, especially when systems combine automation, real-time reporting, analytics capability, system integration, and internal control features.

## **DISCUSSION**

The findings of this study have shown that data-driven accounting system capability has had a strong and statistically significant relationship with financial error reduction in SMEs. The overall mean score for data-driven accounting system capability has been high, with  $M = 4.08$ , while financial error reduction has also recorded a high mean score of  $M = 4.13$ . The correlation result has further confirmed a strong positive relationship between data-driven accounting system capability and financial error reduction, with  $r = 0.68$ ,  $p < 0.001$ . This result has indicated that SMEs with stronger accounting automation, real-time reporting, data analytics capability, system integration, and internal control integration have reported greater reductions in transaction errors, reconciliation errors, invoice errors, payroll errors, tax-related errors, reporting inaccuracies, and audit adjustment errors (Abadie, 2005). This finding has aligned with earlier accounting information system research, which has argued that accounting information systems support organizational performance by improving the collection, processing, storage, and communication of financial information. The result has also been consistent with prior SME-based evidence showing that accounting information systems can improve performance when the system is aligned with the information needs of the firm. In the present study, this relationship has been extended from general performance improvement to a more specific accounting-quality outcome: financial error reduction. The findings have therefore suggested that data-driven accounting systems should not be viewed only as administrative tools for bookkeeping but also as accuracy-enhancing mechanisms that strengthen the reliability of financial records. This interpretation has been supported by Information Processing Theory, which argues that organizations require sufficient information-processing capacity when operational complexity and transaction volume increase. SMEs often face limited staff, informal processes, and fragmented accounting routines, which can increase the probability of financial errors (Ashbaugh-Skaife et al., 2008). The findings have shown that when SMEs increase their information-processing capacity through data-driven accounting systems, they have been better able to reduce errors and improve accounting accuracy (Blundell & Dias, 2009).

The regression findings have provided deeper evidence by showing that all five dimensions of data-driven accounting system capability have significantly predicted financial error reduction. The model

has explained 58.4% of the variance in financial error reduction, with  $R^2 = 0.584$  and Adjusted  $R^2 = 0.572$ , indicating strong explanatory power. Among the predictors, internal control integration has had the strongest effect, with  $\beta = 0.31$ ,  $p < 0.001$ , followed by accounting automation with  $\beta = 0.27$ ,  $p < 0.001$ , system integration with  $\beta = 0.22$ ,  $p = 0.002$ , real-time reporting with  $\beta = 0.19$ ,  $p = 0.006$ , and data analytics capability with  $\beta = 0.17$ ,  $p = 0.011$ . These findings have been consistent with prior studies showing that internal control weaknesses and poor reporting systems are associated with lower accounting quality and higher reporting risk (Cassar, 2009). The strong role of internal control integration has suggested that SMEs have reduced financial errors most effectively when accounting systems have included approval workflows, audit trails, access restrictions, segregation of duties, and validation rules. This has also supported earlier research showing that information-system integration can strengthen enabling control and performance by improving transparency, flexibility, and internal usefulness. The significant effect of accounting automation has also aligned with research on robotic process automation, which has suggested that automated technologies can reduce repetitive manual work and allow accounting professionals to focus on judgment-based tasks (Athey & Imbens, 2006). The present study has added that automation has not only improved efficiency but has also contributed to measurable error reduction. In practical terms, the results have indicated that SMEs should prioritize accounting systems with built-in control and automation features rather than adopting basic bookkeeping software only. Therefore, the study has confirmed that accounting accuracy has depended not merely on software ownership but on the specific system capabilities that support validation, traceability, monitoring, and timely correction (Chapman & Kihn, 2009).

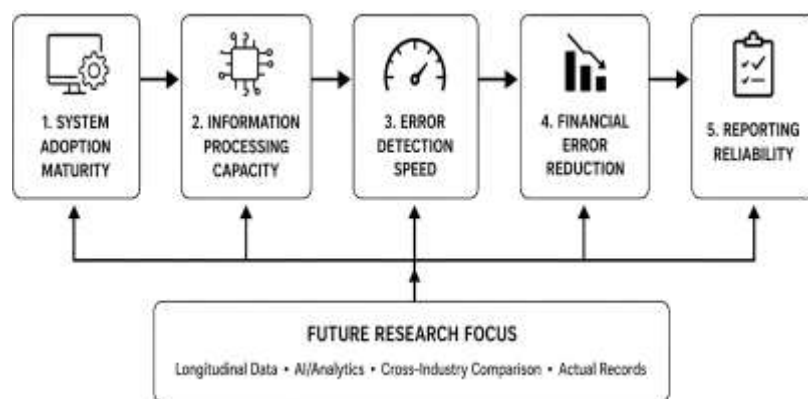
The Difference-in-Differences findings have provided one of the strongest contributions of the study because they have compared changes in financial error rates between adopting and non-adopting SMEs. The treatment group, consisting of SMEs that have adopted data-driven accounting systems, has shown a decline in perceived financial error rate from 3.42 before adoption to 2.01 after adoption, producing a mean reduction of -1.41 points. The control group, consisting of non-adopting SMEs, has shown a smaller decline from 3.35 to 3.08, producing a mean reduction of -0.27 points. The Difference-in-Differences effect has therefore been -1.14, and the interaction coefficient has been statistically significant, with  $\beta = -1.14$ ,  $t = -7.36$ ,  $p < 0.001$ . This result has supported the hypothesis that SMEs adopting data-driven accounting systems have experienced greater financial error reduction than SMEs that have not adopted such systems (Ayyagari et al., 2007). The finding has aligned with methodological literature that has described DiD as a useful approach for estimating treatment effects when treated and untreated groups can be compared over time. It has also aligned with program evaluation literature emphasizing that DiD can strengthen causal interpretation when random assignment is not feasible. In the context of this study, the DiD result has been important because a simple comparison between adopters and non-adopters might have been influenced by firm size, transaction volume, accounting staff experience, or management capability. By focusing on the difference in change between the two groups, the study has provided stronger evidence that adoption has been associated with greater financial error reduction (Ball & Shivakumar, 2005). However, the interpretation has still required caution because the study has used a cross-sectional, case-study-based design and has depended partly on perceived pre-adoption and post-adoption error conditions. Even so, the significant DiD interaction has suggested that data-driven accounting systems have contributed meaningfully to accounting accuracy improvement among SMEs.

The adoption-timing and error-type sensitivity findings have added a creative and trustworthy layer to the discussion because they have shown that financial error reduction has varied according to system maturity and error category. The adoption-timing results have shown that non-adopters have recorded the lowest financial error reduction score, with  $M = 3.12$ , while recent adopters have recorded  $M = 3.84$ , mid-term adopters  $M = 4.17$ , and long-term adopters  $M = 4.39$ . This pattern has suggested that the benefits of data-driven accounting systems have increased as SMEs have gained more experience using the system (Chapman & Kihn, 2009). This finding has aligned with enterprise system research, which has shown that system value often depends on integration, organizational learning, and the fit between system capability and operational requirements. It has also supported the Information Processing Theory argument that organizational information-processing capacity develops through system use, learning, and process adaptation (Dechow et al., 2010). The error-type sensitivity analysis has shown

that transaction entry errors have had the highest reduction score, with  $M = 4.21$ , followed by reconciliation errors with  $M = 4.18$ , financial reporting errors with  $M = 4.16$ , invoice and billing errors with  $M = 4.09$ , audit adjustment errors with  $M = 4.08$ , payroll errors with  $M = 4.04$ , and tax-related errors with  $M = 3.91$ . This finding has indicated that data-driven accounting systems have been most effective in reducing rule-based and process-based errors, such as transaction entry and reconciliation errors, while tax-related errors have shown a slightly weaker reduction because they may depend on external regulations, professional judgment, and interpretation. This result has been consistent with analytics and audit literature showing that automation and analytics are effective for structured tasks, anomaly detection, and evidence processing, while professional judgment remains important in complex accounting and compliance areas (Elbashir et al., 2008). Therefore, the results have shown that data-driven accounting systems have reduced several error types, but their effects have not been uniform across all accounting activities.

The practical implications of the study have been significant for SME owners, accountants, software providers, financial institutions, and policymakers. For SME owners and managers, the findings have suggested that data-driven accounting systems can support better financial accuracy, stronger cash-flow control, improved reporting reliability, and more informed decision-making. Since financial error reduction has been strongly associated with system capability, SMEs should not adopt accounting technologies only for record storage or tax preparation (Granlund, 2011). They should prioritize systems that include automation, real-time dashboards, integrated modules, validation controls, and audit trails. For accountants and finance officers, the findings have emphasized the need to use accounting systems actively for review, reconciliation, analytics, and exception monitoring (Ismail & King, 2005). This has been consistent with prior research showing that accounting and business analytics can improve decision support and operational performance when data are transformed into useful information. For accounting software providers, the study has indicated that SME-focused systems should be designed with simple but powerful error-prevention features, including duplicate invoice alerts, automated bank matching, payroll validation, tax rule reminders, approval routing, and exception dashboards. For lenders and financial institutions, the findings have suggested that SMEs using mature data-driven accounting systems may produce more credible records, which can improve credit assessment and risk evaluation (Low et al., 2011). This implication has aligned with earlier private-firm research showing that verified and reliable financial statements have value in debt financing and external evaluation. For policymakers and SME development agencies, the results have suggested that digital accounting adoption should be part of SME support programs. Training, subsidies, digital literacy programs, and accounting-technology awareness initiatives may help SMEs reduce financial errors and strengthen financial discipline. Therefore, the practical implication of this study has been that accounting digitalization should be treated as an accuracy and control strategy, not only as a modernization strategy (Oliveira et al., 2014).

**Figure 10: Proposed Future Research Model for Digital Accounting Error Reduction**



The theoretical implications of the study have been centered on the application of Information Processing Theory to SME accounting accuracy. The findings have supported the theoretical claim that

SMEs require stronger information-processing capacity when accounting complexity, transaction volume, and reporting requirements increase. The high mean scores for data-driven accounting system capability and financial error reduction, along with the significant correlation, regression, and DiD results, have suggested that improved information-processing capacity has been associated with lower financial error rates. This has extended Information Processing Theory into a specific accounting context by showing that automation, real-time reporting, analytics, system integration, and internal control integration can function as information-processing mechanisms. Prior research has connected information systems with organizational performance, management control, and decision-making, but the present study has extended this discussion by positioning financial error reduction as a measurable accounting outcome (Plumlee & Yohn, 2010). The study has also contributed to the accounting information systems literature by combining system capability measures with DiD logic. Earlier AIS research has shown that accounting systems can support organizational performance and information quality, while analytics research has shown that data capabilities can improve firm outcomes. This study has added a more focused model in which data-driven accounting systems have influenced a specific operational accounting outcome: financial error reduction (Rikhardsson & Yigitbasioglu, 2018). The theoretical model supported by this study can be expressed as: Data-Driven Accounting System Capability → Accounting Information-Processing Capacity → Financial Error Reduction. This model has suggested that the effect of technology on accounting accuracy is not automatic; it works through improved capacity to capture, validate, integrate, analyze, and report financial information. Therefore, the theoretical contribution has been the development of a more precise explanation of how data-driven accounting systems reduce accounting errors in SMEs through information-processing mechanisms. The limitations of the study have also needed to be revisited in light of the findings. First, the study has used a cross-sectional, case-study-based design, which has limited the ability to establish full causal certainty. Although the Difference-in-Differences logic has strengthened the analysis, the study has partly relied on respondents' recalled or perceived pre-adoption and post-adoption financial error rates. This may have introduced recall bias, especially if respondents have overestimated the benefits of data-driven systems or underestimated earlier error rates (Salehi et al., 2010). Second, the study has used Likert-scale responses, which have allowed statistical analysis but may not have captured the exact number or monetary value of financial errors. Future research can improve this by using actual accounting records, audit reports, reconciliation logs, correction entries, and tax adjustment data. Third, the sample has included 220 SME respondents, which has been adequate for the statistical procedures used, but the findings may not be fully generalizable to all SMEs across countries, sectors, and regulatory environments (Trigo et al., 2014). Fourth, the study has measured data-driven accounting system capability through five dimensions, but other factors such as staff training, cybersecurity maturity, vendor support, management commitment, and accounting policy quality may also affect financial error reduction. Fifth, the study has not fully separated the effects of different software types, such as cloud accounting, ERP systems, AI-enabled accounting platforms, and basic desktop accounting tools. These limitations have not weakened the overall value of the findings, but they have defined the boundaries within which the results should be interpreted. The study has provided strong evidence that data-driven accounting systems are associated with financial error reduction, while also showing that stronger longitudinal and record-based designs would provide more robust causal evidence. Therefore, the limitations have created a foundation for improving future research design, measurement, and model development.

Future research should improve this study by developing a stronger longitudinal and multi-source model for measuring the impact of data-driven accounting systems on financial error reduction. The most important future research direction is the development of a Longitudinal Digital Accounting Error Reduction Model, which can be written as: System Adoption Maturity → Information Processing Capacity → Error Detection Speed → Financial Error Reduction → Reporting Reliability. In this model, system adoption maturity would measure the length of system use, depth of feature use, staff training, and level of workflow integration. Information processing capacity would measure automation, real-time reporting, analytics capability, system integration, and internal controls. Error detection speed would measure how quickly SMEs identify transaction errors, reconciliation mismatches, invoice problems, payroll mistakes, tax inconsistencies, and reporting inaccuracies. Financial error reduction

would be measured using actual accounting records rather than only Likert-scale perceptions. Reporting reliability would measure the quality of financial reports, audit adjustments, lender confidence, and compliance outcomes. Future researchers can also improve the Difference-in-Differences design by collecting panel data from SMEs before and after adoption over several reporting periods, such as quarterly or yearly observations. This would allow researchers to test whether financial error rates decline gradually as system maturity increases. Another useful future model would be an AI-Enabled Accounting Control Model, where artificial intelligence, anomaly detection, predictive analytics, and automated risk scoring are tested as advanced system capabilities. This model could examine whether AI-based systems reduce errors more effectively than ordinary accounting software. Future studies may also compare industries, countries, and software categories to determine whether the effect of data-driven accounting systems differs across business environments. In addition, researchers may use mixed-method designs by combining survey data with interviews, accounting records, audit files, and software-generated error logs. This would improve measurement accuracy and provide deeper explanations of how SMEs actually use digital systems in daily accounting work. Therefore, future research should move from perception-based assessment toward record-based, longitudinal, and AI-enhanced models that can provide stronger evidence about the causal effect of data-driven accounting systems on financial error reduction.

## **CONCLUSION**

This study has concluded that data-driven accounting systems have had a significant positive influence on financial error reduction in small and medium-sized enterprises. The research has examined the relationship between accounting automation, real-time reporting, data analytics capability, system integration, internal control integration, and financial error reduction using a quantitative, cross-sectional, case-study-based design supported by Likert-scale survey data, descriptive statistics, correlation analysis, regression modeling, and Difference-in-Differences analysis. The findings have shown that SMEs using stronger data-driven accounting system capabilities have reported higher levels of financial error reduction than SMEs relying on traditional or less automated accounting systems. The descriptive results have indicated that SMEs have used data-driven accounting systems at a high level, with strong mean scores for automation, real-time reporting, internal control integration, system integration, and data analytics capability. The correlation analysis has confirmed that each major system dimension has had a significant positive relationship with financial error reduction, showing that improved digital accounting capability has been associated with fewer transaction entry errors, reconciliation errors, invoice and billing errors, payroll errors, tax-related errors, reporting inaccuracies, and audit adjustment errors. The regression analysis has further confirmed that internal control integration has been the strongest predictor of financial error reduction, followed by accounting automation, system integration, real-time reporting, and data analytics capability. This has demonstrated that financial accuracy in SMEs has depended not merely on the adoption of accounting software but on the depth and quality of system features used in daily accounting processes. The Difference-in-Differences analysis has provided stronger evidence by showing that SMEs that adopted data-driven accounting systems have experienced a greater reduction in financial error rates than non-adopting SMEs. The adoption-timing analysis has also shown that long-term adopters have achieved stronger financial error reduction than recent adopters and non-adopters, suggesting that system maturity, user familiarity, and process integration have strengthened the effectiveness of data-driven accounting systems over time. The error-type sensitivity analysis has shown that the strongest reductions have occurred in transaction entry errors, reconciliation errors, and financial reporting errors, while tax-related errors have shown a slightly lower reduction due to their dependence on regulatory knowledge and professional judgment. The study has supported Information Processing Theory by confirming that SMEs with stronger information-processing capacity have been better able to capture, validate, analyze, integrate, and report financial information accurately. Overall, the study has established that data-driven accounting systems can serve as practical tools for improving accounting accuracy, strengthening internal control, reducing financial error rates, and improving the reliability of SME financial information. Therefore, the research has fulfilled its objectives and has supported all proposed hypotheses by demonstrating that data-driven accounting system adoption has been a meaningful factor in reducing financial errors in SMEs.

## **RECOMMENDATIONS**

Based on the findings of this study, SMEs should adopt data-driven accounting systems not only as bookkeeping tools but as integrated financial control systems that can improve accuracy, reduce errors, and strengthen decision-making. SME owners and managers should prioritize accounting systems that include automation, real-time reporting, data analytics capability, system integration, and internal control features rather than relying only on basic accounting software or manual spreadsheets. Since internal control integration has been the strongest predictor of financial error reduction, SMEs should ensure that their accounting systems include approval workflows, user-access restrictions, audit trails, validation rules, segregation of duties, and automated exception alerts. These controls can help prevent unauthorized entries, detect unusual transactions, and create a clear record of financial activities. Accounting automation should also be strengthened because automated transaction posting, invoice processing, bank reconciliation, payroll calculation, and recurring journal entries can reduce repetitive manual errors. SMEs should also make better use of real-time financial reporting tools so that owners, accountants, and managers can monitor cash flow, receivables, payables, expenses, and account balances without waiting until the end of the reporting period. Data analytics capability should be developed through dashboards, trend analysis, anomaly detection, and error alerts so that financial inconsistencies can be identified early. SMEs should also integrate accounting systems with sales, inventory, payroll, banking, purchasing, and tax-related functions to reduce duplicated data entry and inconsistencies between departments. Accounting staff should receive regular training on how to use digital accounting systems effectively, interpret system-generated reports, respond to alerts, and maintain data quality. SME managers should also establish written accounting procedures so that system use is consistent across users and business units. Software providers should design affordable, user-friendly, SME-focused accounting systems with built-in reconciliation tools, automated controls, customizable dashboards, and simple analytics features. Policymakers and SME development agencies should support digital accounting adoption through training programs, subsidies, awareness campaigns, and technical assistance, especially for smaller firms with limited financial and technological resources. Financial institutions and lenders should encourage SMEs to use reliable digital accounting systems because accurate financial records can improve credit assessment and reduce information risk. Professional accounting bodies should also promote digital accounting literacy among SME accountants and bookkeepers. Future implementation should be gradual but systematic, beginning with automation of basic accounting tasks and expanding toward analytics, control integration, and real-time reporting. Overall, SMEs should view data-driven accounting systems as long-term investments in financial accuracy, internal control, operational efficiency, and organizational credibility. By strengthening accounting information-processing capacity, SMEs can reduce financial error rates, improve reporting reliability, support better managerial decisions, and build stronger trust with lenders, regulators, suppliers, investors, and other stakeholders.

## **LIMITATIONS OF THE STUDY**

This study has several limitations that should be considered when interpreting the findings. First, the research has used a quantitative, cross-sectional, case-study-based design, which means that data have been collected at one point in time rather than across multiple periods. Although the study has applied a Difference-in-Differences analytical logic by comparing perceived pre-adoption and post-adoption error conditions between adopters and non-adopters, the cross-sectional nature of the data has limited the ability to establish full causal certainty. A stronger causal design would require actual longitudinal data collected before and after system adoption over several months or years. Second, the study has relied on self-reported questionnaire responses measured through a five-point Likert scale. While this approach has been useful for collecting standardized data from SME respondents, it may have introduced response bias, recall bias, or social desirability bias. Some respondents may have overestimated the benefits of data-driven accounting systems or underestimated past financial errors. Third, the study has measured financial error reduction through perceived reductions in transaction errors, reconciliation errors, invoice errors, payroll errors, tax errors, reporting inaccuracies, and audit adjustment errors. Although these measures have provided useful insight into SME accounting accuracy, they may not fully capture the exact number, frequency, monetary value, or severity of actual financial errors. Fourth, the sample has included 220 SME respondents, which has been suitable for

descriptive statistics, correlation analysis, regression modeling, and Difference-in-Differences estimation, but the findings may not be fully generalizable to all SMEs across different countries, industries, regulatory environments, and technological contexts. Fifth, the study has grouped data-driven accounting systems into broad dimensions such as automation, real-time reporting, data analytics capability, system integration, and internal control integration, but it has not deeply compared specific software platforms, cloud systems, ERP systems, AI-enabled accounting tools, or industry-specific accounting applications. Sixth, the study has not fully examined external factors such as tax regulation complexity, accounting staff training quality, cybersecurity maturity, management commitment, software vendor support, and organizational culture, although these factors may influence the effectiveness of data-driven accounting systems. Seventh, the study has focused mainly on SMEs, so the results may not apply directly to large enterprises with more complex accounting infrastructures, stronger internal audit departments, and advanced enterprise systems. Finally, the Difference-in-Differences component has depended partly on perceived before-and-after changes, which may be less precise than actual accounting records, audit logs, reconciliation reports, or system-generated error data. These limitations have not reduced the value of the study, but they have defined its scope and boundaries. Future studies should use longitudinal data, larger samples, actual financial error records, industry comparisons, and mixed-method approaches to produce stronger and more detailed evidence.

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